6D-0619

An ISO 9001 : 2000 Certified Company

G M ENGINEERING

Ball Valve

One stop **solutions for** all types of **valve requirements**

One stop **solutions for** all types of **valve requirements**

Valve, with their diverse role, play a pivotal role in industries. And their crucial function calls for a careful approach and deep insights of the whole mechanism, where a valve is placed.

At GM Engineering, with years of experience of working for a whole gamut of industries, we have developed a sharp understanding of valves and their varying roles. Designed by engineering brilliance and developed with finest raw material and precision, our valves precisely does what is expected from them.

Valve **Applications**

- Chemical & Process industries
- Refineries
- Petrochemicals & Fertilizer Plants
- Pharmaceuticals
- Oil Exploration
- Thermal & Nuclear Plants
- Food & Beverage industries
- Effluent Treatment & Sewerage Plants
- Water Treatment
- Cooling water & Water supply plants
- Mining Industries etc

Environment

Acting Green

At GM Engineering thinking green is just an aspect of a whole story. Our concern for the environment doesn't end at thinking for it, we actually act in greener ways. We have invested heavily in technologies that ensure environment friendly manufacturing processes and go beyond. As a responsible corporate citizen, we are well aware of our social responsibilities and we are committed to give back the nature, in sustainable, thoughtful ways.


GM

Who **we are**

GM Engineering offers you various range of industrial valves for all your process handling needs. GM Engineering's strength is quality products at affordable prices, prompt delivery and the unflinching commitment to excel. The products have been enjoying a sustained presence in the national for over last 10 years in chemical and process industries.

GM Engineering's Products are widely used in chemical & Process industries, Refineries, Petrochemicals & Fertilizer Plants, Pharmaceuticals, Oil Exploration, Thermal & Nuclear Plants, Food & Beverage industries, Effluent Treatment & Sewerage Plants, Water Treatment, Cooling water & Water supply plants, Mining Industries etc.

The Company was founded in Year 1996. GM Engineering achieved reputation and trust within a very short span. Thanks to our user friendly direct marketing, far sighted & honest business policy.

We are having vast experience in the field of valve manufacturing. Strict Quality control norms are maintained at various levels of production and full fledged testing facility through latest technology ensures constant quality.

Continuous development & products improvement is our motto.
GM Engineering has continually worked to develop innovative and quality products and has earned a reputation for technical excellence in the valve industry and accredited with ISO 9001:2000 Certification by TUV Suddeutschland.

GM Engineering is certified by American Petroleum Institute to use API 6D Monogram. Research and development work continually made by GM Engineering Focusing at an advanced technology of environmental compatibility has resulted in a product range that warrants safe and reliable operation in compliance with virtually all and any requirements.

GM Engineering Offers design and technical assistance in developing varieties of products. GM Engineering is always ready to assist customers in developing products that can be mutual benefit and ensure GM as an ideal partner at all time. GM Continually strives to uphold the company objective to "Build a reputation in the field by providing proven in terms of perfection, Precision and Innovative Products Design with best possible quality / competitive price ratio".

Leadership is the element that shows the way,
that sets the pace.

At **GM Engineering,** we are led with
courage, knowledge, experience and action.

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Technical Features of **Ball Valve**

GM trunion mounted ball valves have been designed for severe service and generally used in the Petrochemical, Refining, Upstream Oil and Gas, Power and Chemical applications. The designs incorporate many features which ensure reliable and repeatable shut off performance whilst providing the highest levels of safety as demanded by these Industries.

KEY FEATURES

* Design, manufacture and materials conform to the essential requirements of API 6D, ISO 14313, ASME B16.34, ASME VIII.

* Certified Firesafe in accordance with API 607 / API 6FA.

* Body wall thickness is according to ASME B16.34, as a minimum.

* Full and reduced bore valves available.

* Bolted construction for ease of on-site maintenance.

* 2 or 3 piece body, end entry, pin trunnion mounted ball design.

* Anti-blow-out bottom entry stem shouldered to the body, not the bonnet or an intermediate part bolted to the valve.

* High integrity stem sealing system prevents atmospheric leakage.

* Low temperature and cryogenic service designs available.

* Stem seals are replaceable without the need to remove the valve from the pipeline or totally disassemble the valve.
* Guided stem (bearings) with hardness control between parts to minimise operational torques.

* Anti-static design (10Ω under 12 Volt).

* Positive seat sealing at high and low differential pressures.

* Bi-directional, double block & bleed design allowing the venting and draining of the body in the open & closed position.

* Pressure and spring assisted seat design is of the single piston effect.

* Positive cavity relief via spring loaded seat design to the low pressure side.

* Emergency sealant injection provision to seat and stem seal is available.

* Testing and marking to API 6D.

* Available with pneumatic, hydraulic or electric actuators.

Options and Variations

OPERATION METHODS
GM range of valves may be manually operated by lever or gearbox depending on torque requirements, or by actuator (pneumatic, hydraulic or electric). Please refer to GM technical sales department to confirm torque requirements.

SEALANT INJECTION
A sealant injection system may be specified as an optional feature, so that, in the event of damage being caused to the sealing face of the seat insert or primary o-ring seals, an emergency seal may be formed by injecting a PTFE based compound into the sealing area.

EMERGENCY SHUT DOWN VALVES
The GM valves are ideal for ESD applications. Full details of the relevant specifications must be provided to our technical department so that compliance may be

LOW TEMPERATURE SERVICE
GM ball valves can be supplied for use in low temperature or cryogenic service.

Extended bonnet designs are of the fully enclosed vapour space type whereby stem seals are located at the top of the bonnet outside of the cold zone and fully maintainable without the need to remove the stem or valves from the pipeline.

Extended bonnets are recommended for valves which are required to be operated (opened & closed) for service at temperatures below -50°C (-58°F) or above 200°C (392°F).

SPECIAL COATINGS
The wear resistance and corrosion resistance of seat and seal areas may be enhanced by the use of weld overlays, electroless nickel coating, stellite deposition or other hard surface processes. Please consult with our technical department for specific requirements.

METAL SEATED VALVES
GM are able to offer a comprehensive range of metal to metal seated ball valves for abrasive and elevated temperature applications, beyond the capability of soft seated valves.

UNDERGROUND / BURIED SERVICE VALVES
Operator extensions may be specified where valves are to be installed in underground locations. Such extensions will also be fitted with the necessary piping to facilitate drain, vent and sealant injection or lubrication as required.

SOUR SERVICE
Valves are available conforming to the requirements of the NACE specification MR 01-75 or MR 0103 for use on applications where the presence of wet H2S generates a risk of stress corrosion cracking. NACE compliance certificates are available on request.

ALTERNATIVE MATERIALS

Body & Trim	CF3M / 316L	
	Duplex Stainless Steel	
	Inconel 625, Monel, Titanium	Other materials available on request.
Seats	Reinforced PTFE	Low temp. / low pressure. Suitable up to Class 600 only
	PEEK	High temp. / high pressure.
	PCTFE (KEL-F)	Low temp. / high pressure.
Primary Seals	Hydrogenated HNBR	Low temp. service. Explosive decompression. Methanol
	Fluorosilicon	Low temp. service.
	FKM GLT	Low temp. service.
	PTFE / Elgiloy	Low temp. / cryogenic service Resistant to most chemicals
	Graphite	High temp. / low temp. Resistant to most chemicals

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Ball Valves - API 6D Design Features & Applications

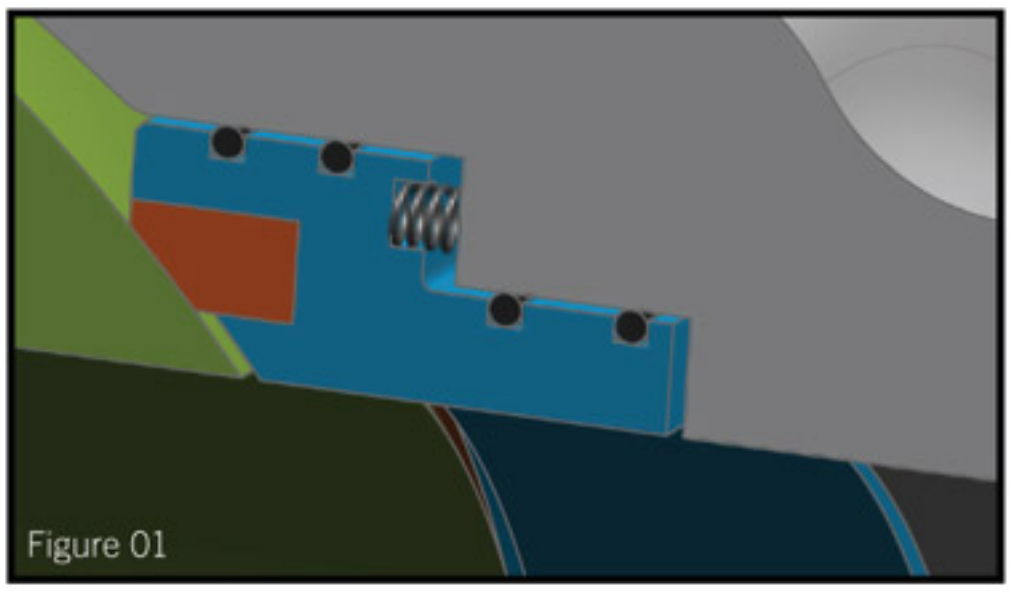

Figure 01

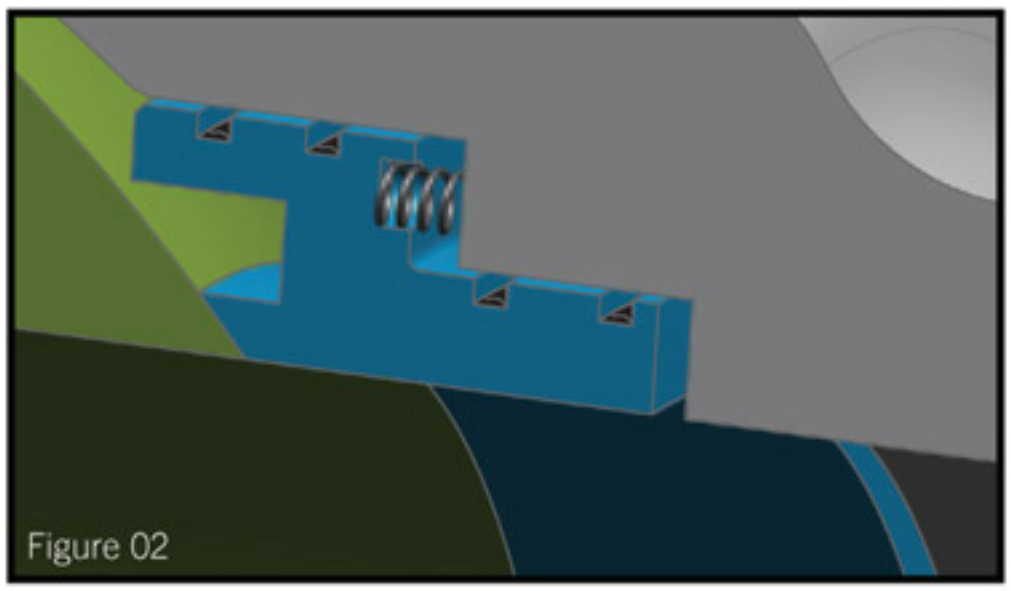

Figure 02

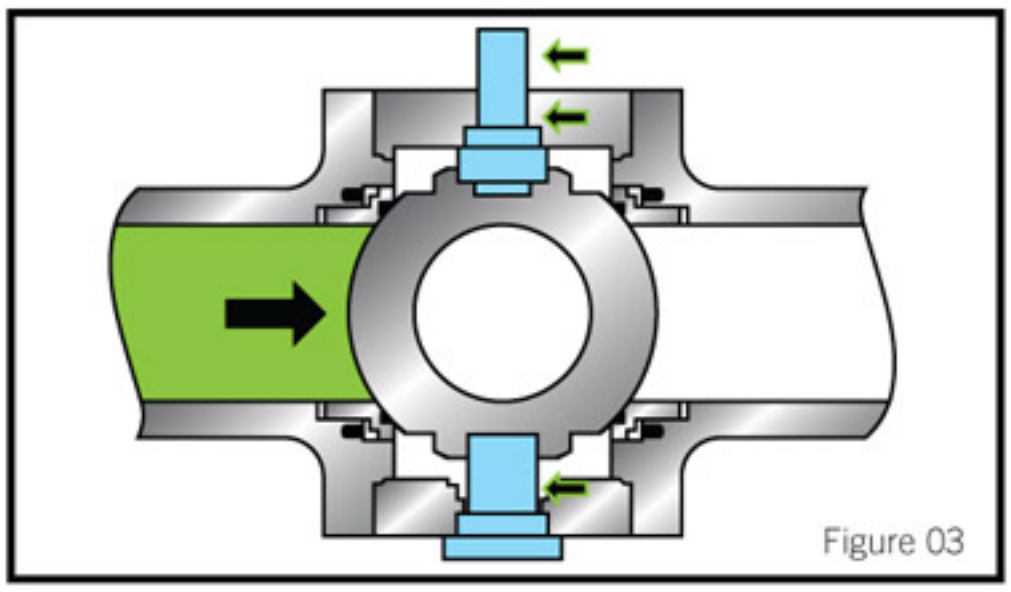

Figure 03

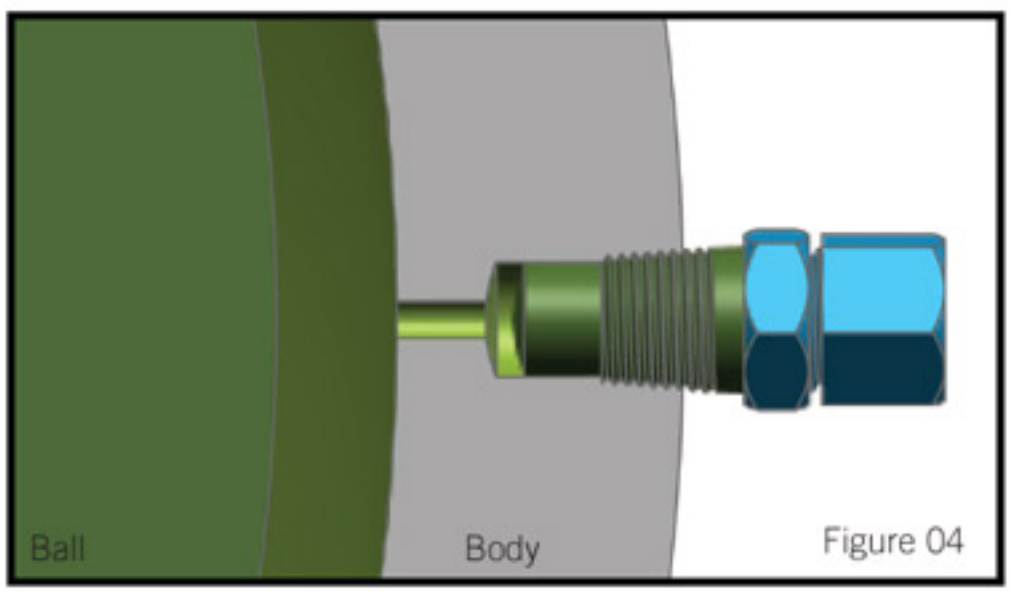

Figure 04

GM's standard ball valves have been designed to API's highest standards. Complete Split body & Fully welded design offers maximum protection against line pressure and thermal distortion with long life and trouble-free performance.
GM is supplying its products to the Crude oil transport and processing, Power engineering, Water supply systems and Process Industries throughout the world.

Seal Feature

GM ball valves are produced with spring-loaded seats. This spring load keeps the seat in contact with the ball even in absence of line pressure and makes very efficient seal at low line pressure.As line pressure increases, the seat area creates a piston effect which forces the seat against the ball, therefore a tight seal becomes effective. If the pressure is higher, the force exerted by the seat on the ball is increased by action of the pipeline pressure. Therefore, the higher the line pressure, the greater the piston action.

Self Lubrication

Self lubrication, low friction PTFE is used for trunnion and stem bearings. NYLON or other low friction materials are used for seat inserts. Self lubricating seals and stem bearing give predictable operating torque for the life of the valve.

Fire Safe Construction with Secondary Metal Seat

GM's ball valves have been fire tested and can be supplied to API 6FA and API 607. The soft seat inserts, irrespective of their materials, will possibly fail when subjected to sudden high temperature conditions. GM provides a fire-safe design which may substantially prevent leakages through seals when damaged by high temperature. The function of the seats before and after the fire test is shown on the sketches. If the seat inserts are destroyed or burned out, a metal to metal seal is formed between the lower diameter of the seat and ball, while the seat to body seals, the stem packing and the end connections to body seals are designed to resist high temperature and will remain undamaged.
(Figures 1 & 2)

Trunnion Mounting

Trunnion mounted stems absorb the thrust from line pressure, preventing excess friction between the ball and seats, so even at full rated working pressure, operating torque stays low.
(Figure 3)

Body Vent and Drain

The body cavity may be vented in both open and closed state.
(Figure 4)

Double Block and Bleed
The seats are of both-side-sealing type, which means that they seal both on the upstream or downstream side of the ball valve and inside the valve. Whether in the open or closed position, pressure on each side of the ball is blocked from the body cavity by the seat rings engineered to self relieve. No pressure build up can occur in to body cavity. The body cavity can then be vented to the atmosphere or drained through the body port. (Figure 5)

Sealant Fitting
Sealant lubrication fittings come as a standard with GM's design. In the event of seat insert or stem seal damage, external or internal leakage can occur. Emergency sealant injection can save the integrity of the valve by incorporating a sealant seal around the stem or between the seat and the ball until such time the valve may be properly serviced. (Figures 6 & 7)

Antistatic Device
The springs provided at the stem allow the static charges to be led to the piping. In this way, an electrostatic charging of the ball is eliminated. (Figure 8)

Stem Seal with Blow Out Proof Stem
The stem is independent of the ball and is a blow-out proof design. As an integral part, a stem has a flange at its lower side. The stem flange prevents the stem from blowingout. This feature also allows replacement of stem packing while the valve is under pressure.The torque is transmitted to the ball by a generously proportioned mating joint, hence the stem is not affected by the side thrust.

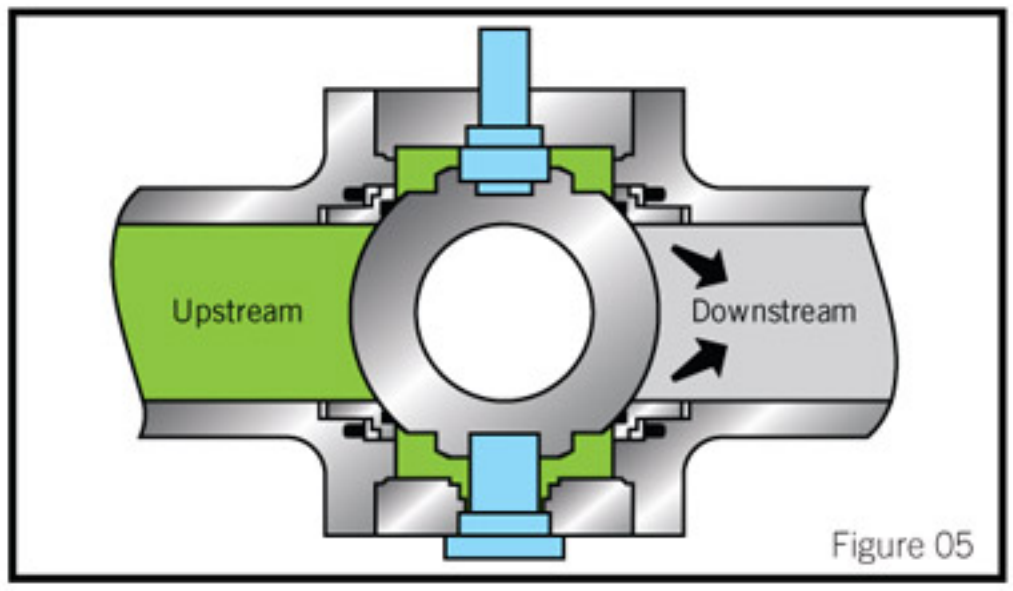

Figure 05

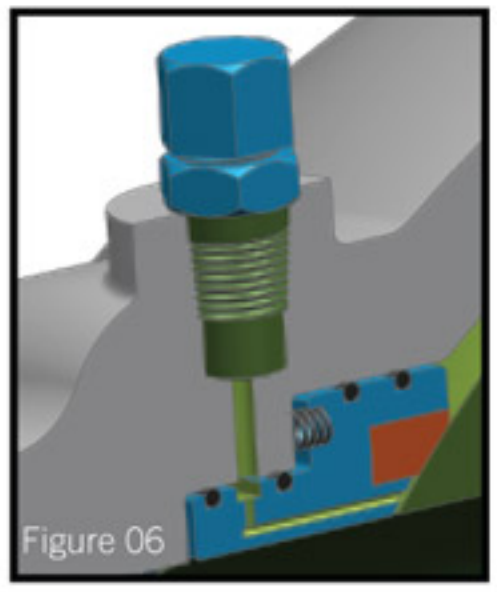
Figure 06

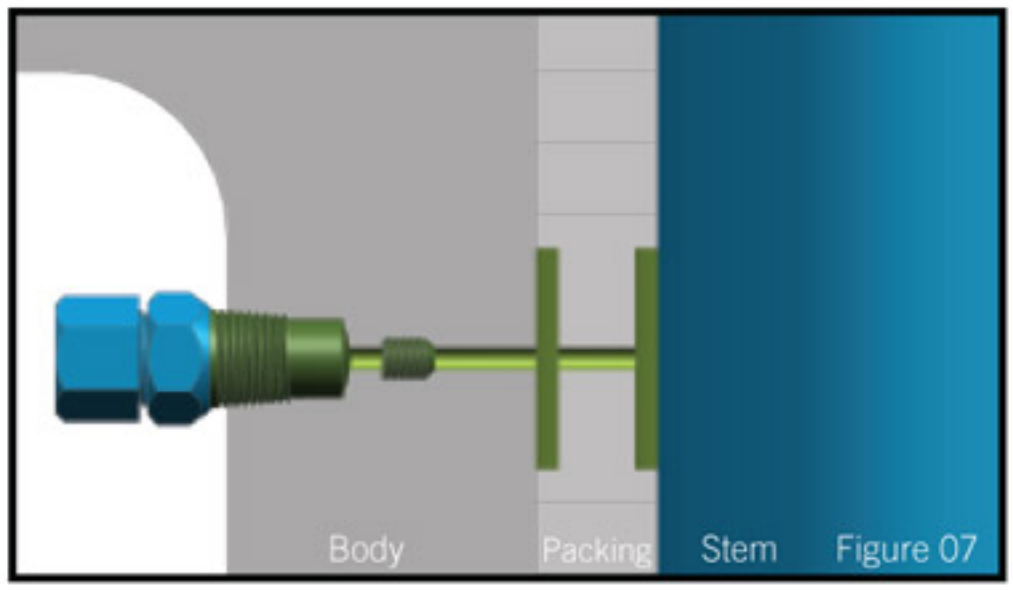

Figure 07

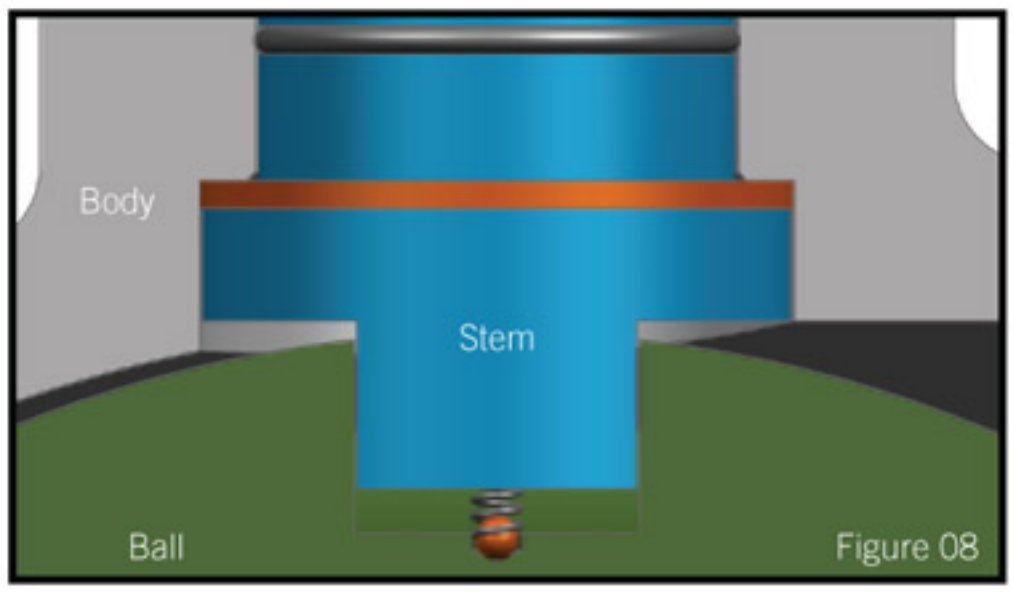

Figure 08

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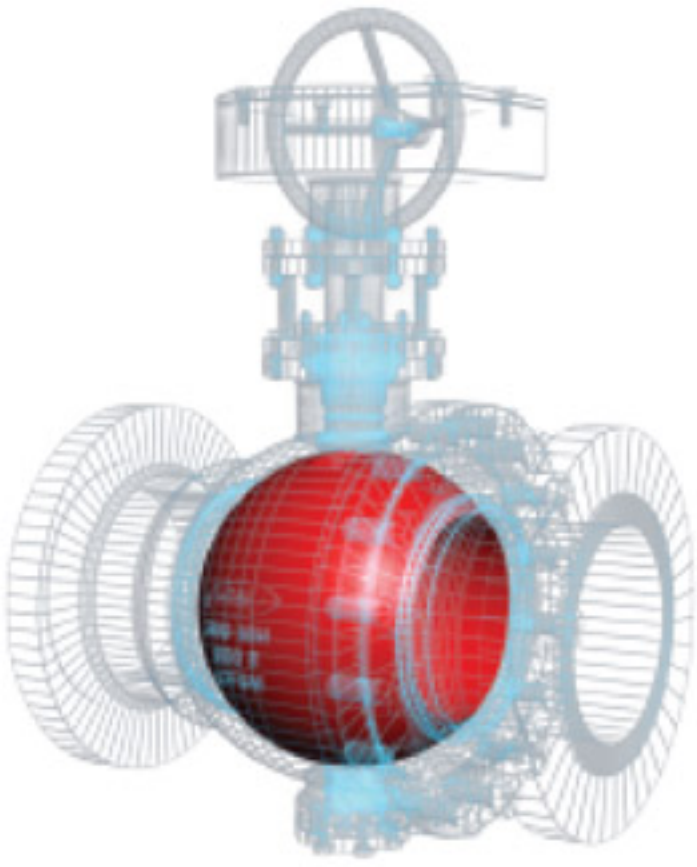
Technical Data for Optional Seal Selections

Material	Description
BUNA	Also called buna N or Nitricle, this sealing material is widely used because of its compatability with most hydraulic fluid media, including petroleum oils, water, water glycol, Di-Ester based fluids, air, and inactive gases. The temperature of this material ranges from -54C to + 135C (-65F to +275F).
NEOPRENE	This sealing material is excellent for refrigerants, amonia, and freon, Its temperature range is from -37C to +107C (-35F to + 225F).
EPDM	Also called Ethylene-Propylene, this sealing material is recommended for low pressure steam, hot water, phosphate ester base fluid, weak alkalines, and acids. This material is not recommended for petroleum service, hydrocarbons, alchohol, and radiation. Its temperature range is -54C to 149C (-65F to + 250F).
VITON	Also called Fluorocarbon Rubber (FKM), this material is known for being excellent in condition up to +204C (+400F). Viton offers excellent resistence to aggressive fuels and chemicals.
PTFE	Teflon has excellent resistence to a wide range of chemicals. Its is excellent at pressure below 1500 PSI. It can withstand temperatures up to +204C (400F).
NBR	NBR is typically resistant to mineral oil-based lubricatns and greases, hydraulic fluids, hydrocarbons, and water. NBR is not resistant to polar solvents or chlorinated hydrocarbons. The material's temperature range is from -30C to + 100C (-22F to +212F).
HNBR	HNBR is simply hydrogented NBR. It is typically resistant to mineral oil-based lubricants and greases, hydraulic fluids, hydrocarbons, and water just like NBR. HNBR is more resistent to heat, o-zone, and aging than NBR. The material's temperature range is from -30C to +100C (-22F to +212F).
SILICONE	This material is capable of operating in a wide temperature range and has excellent resistence to o-zone, water, weathering, and aging. This material is generally not resistent to fuels, oils, steams, acids, or high pressures. This material temperature range is from -65C to +250C (-85F to +482F).
FLUOROSILICONE	This meterial is far more resistent to oils and fuels than other silicones. The temperature range, However, is limited from -73C to +177C (-100F to +350F).
GRAPHOIL	Grafoil is chemicaly resistant to attack from nearly al organic and inorganic fluids with exception of highly oxidizing chemicals and highly concentrated oxidizing mineral acis. The material is good up to + 535C (+1000F) as well as at cryogenic temperatures.
FLUORSINT	This material contains a mica filler and offers superb mechnical properties such as resistance to abrasion, wear, and extrusion. It is ideal for high pressure applications and offers low co-efficient of friction. Its temperature range is from -46C to +343C (-50F to +650F).

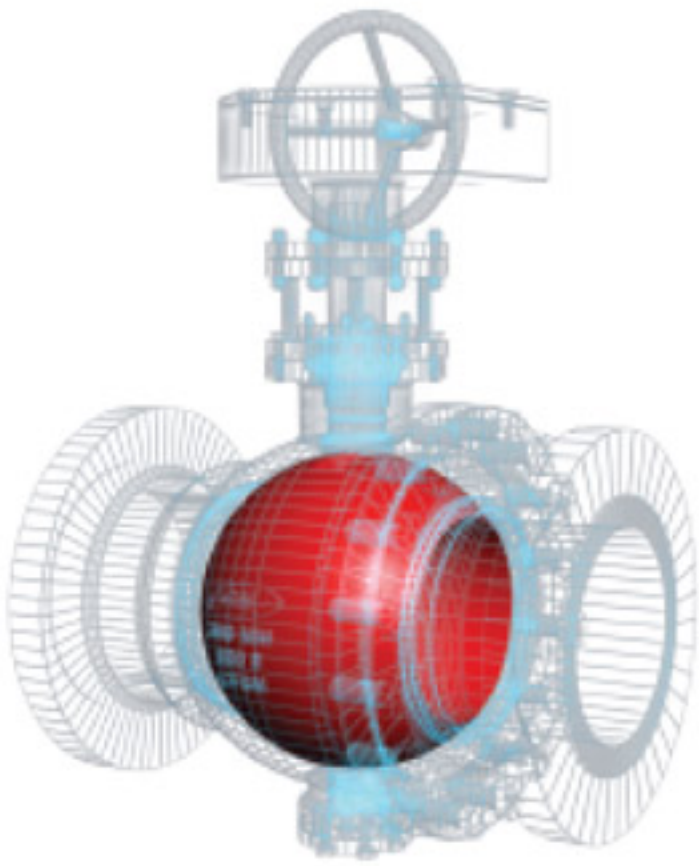
Note: Additional options available upon request



Technical Data for Optional Seat Selections

Material	Description
DEVLON	Devlon is a polyamide with additives which allo it to perform at -46C to 121C (-50F to +250F). This material covers a wide range of applications while having excellent wear properties, low friction, and improved impact strength.
METAL (STELLITE)	Metal seats hardfaced with Stellite 6 are recommended for use in high temperature fluid and gas applications. The temperature range of the material allows it to get up to the maximum temperature of the valve body material.
METAL (TUNGSTEN CARBIDE)	Metal seats hardfaced with Tungsten Carbide are recommended for use in high temperature fluid and gas applications. The temperature range of the material allows it to get up to the maximum temperature of the valve body material.
NYLON	Nylon is offered for thigh pressure applicatons. The material is ideal for use in high pressure air, oil, and other gas media but is not suitable for strong oxidizing agents. The temperature range of ths material is -34C to + 121C (-29F to + 250F).
NOVA	This Teflon based product is filled with glass amorphous carbon powder and graphite. It has a lower thermal contraction expansion then PTFE and is ideal for steam or thermal fluid applications up to 288C (+550F).
PEEK	Peek offers a unique combination of chemical, mechanical, and thermal properties. This material is excellent for high temperatures up to +260C (+500F).
TEFLON (VIRGIN PTFE)	PTFE is a fluorocarbon based polymer offering a unique combination of physical and mechanical characteristics such as non flamability, chemical, resistance, and near zero moisture absorbtion. The temperature range of this material is from -240C to + 204C (-400F to + 400F).
PTCFE	Kel-F is a fluorocarbon based polymer offering a unique combination of physical and mechanical characteristics such as non flamability, chemical reisistance, and near zero moisture absorbtion. The temperature range of this material is from -240C to +204C (-400F to +400F).
RPTFE	PTFE's mechanical properties are enhanced by adding a percentage of filler material to provide improved strength, stability, and wear resistance. The temperature range of this materials is -46C to +232C (-50F to +450F).

Note: Additional options available upon request



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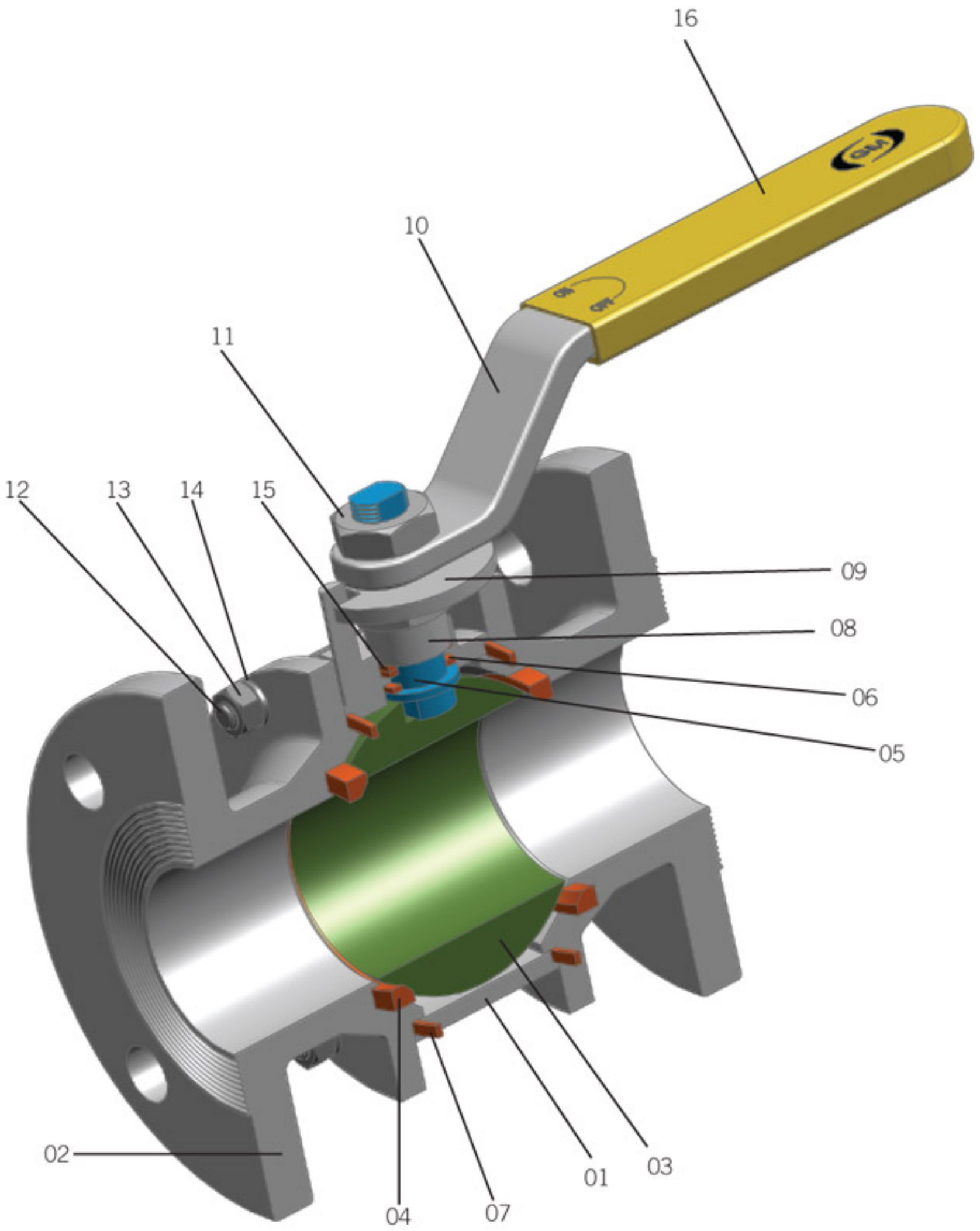
3 Piece Flanged End **Ball Valve**



Applications

- Chemical & Process industries
- Refineries
- Petrochemicals & Fertilizer Plants
- Pharmaceuticals
- Oil Exploration
- Thermal & Nuclear Plants
- Food & Beverage industries
- Effluent Treatment & Sewerage Plants
- Water Treatment
- Cooling water & Water supply plants
- Mining Industries etc

Technical **Specifications**

3 Pcs. Folating Ball Valve

1	Body	ASTM A 216 GR. WCB	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
2	Side Piece	ASTM A 216 GR. WCB	ASTM A 351 GR. CF8/ CF8M	ASTM A 352 GR. LCB
3	Ball	ASTM A 351 GR. CF8	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
4	Body Seat	PTFE / RPTFE / PEEK / METAL & SECONDRY METAL TO METAL	PTFE / RPTFE / PEEK / METAL & SECONDRY METAL TO METAL	PTFE / RPTFE / PEEK / METAL & SECONDRY METAL TO METAL
5	Stem	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304/ASTMA 470 TYPE 316	ASTM A 276 TYPE 410
6	Stem seal	PTFE/GFT/GRAPHITE	PTFE/GFT/GRAPHITE	PTFE/GFT/GRAPHITE
7	Body seal	PTFE/GFT/PEEK/GRAPHITE	PTFE/GFT/PEEK/GRAPHITE	PTFE/GFT/PEEK/GRAPHITE
8	Gland bush	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304/ASTMA 470 TYPE 316	ASTM A 276 TYPE 410
9	Stopper	MS	SS 304/SS 316	MS
10	Lever	MS	SS	MS
11	Lever nut	ASTM A 194 GR. 2H	ASTM A 194 GR. 8 / 8M	ASTM A 194 GR. 2H
12	Body stud	ASTM A 193 GR. B7	ASTM A 193 GR.B8 / B8M	ASTM A 320GR. L7
13	Hex nut	ASTM A 194 GR. 2H	ASTM A 194 GR. 8 / 8M	ASTM A 194 GR. 4
14	Spring washer	SPRING STEEL	SPRING STEEL	SPRING STEEL
15	Gland packing	PTFE	PTFE	PTFE
16	Lever sleeve	PVC	PVC	PVC

Size Range	:	15 mm to 150 mm
Pressure Rating	:	ANSI Class 150 to Class 600
Connection	:	Flanged to ASME B16.5 (2" ~ 24") Butt-weld ends to ASME B16.25 Clamp ends on request.
Body Materials	:	Carbon steel, ITCS, Stainless steel, Duplex, Super Duplex, Inconel 625 and other special alloys.
Temp. Range	:	-196°C + 200°C (-320°F to + 392°F)
Design	:	ISO 172692 / API 6D / ASME B16.34
	:	ISO 14313 / ASME VIII
Face to Face	:	ASME B16.10 / API 6D
Fire Testing	:	API 607 / API 6FA / BS EN ISO 10497
Pressure Testing	:	API 6D
Certification**	:	EN 10204 / ISO 10474
	:	NACE MR 01-75 / ISO 15156 / MR 0103
Quality Assurance	:	ISO 9001 / API Monogram

**NACE compliance available on request.

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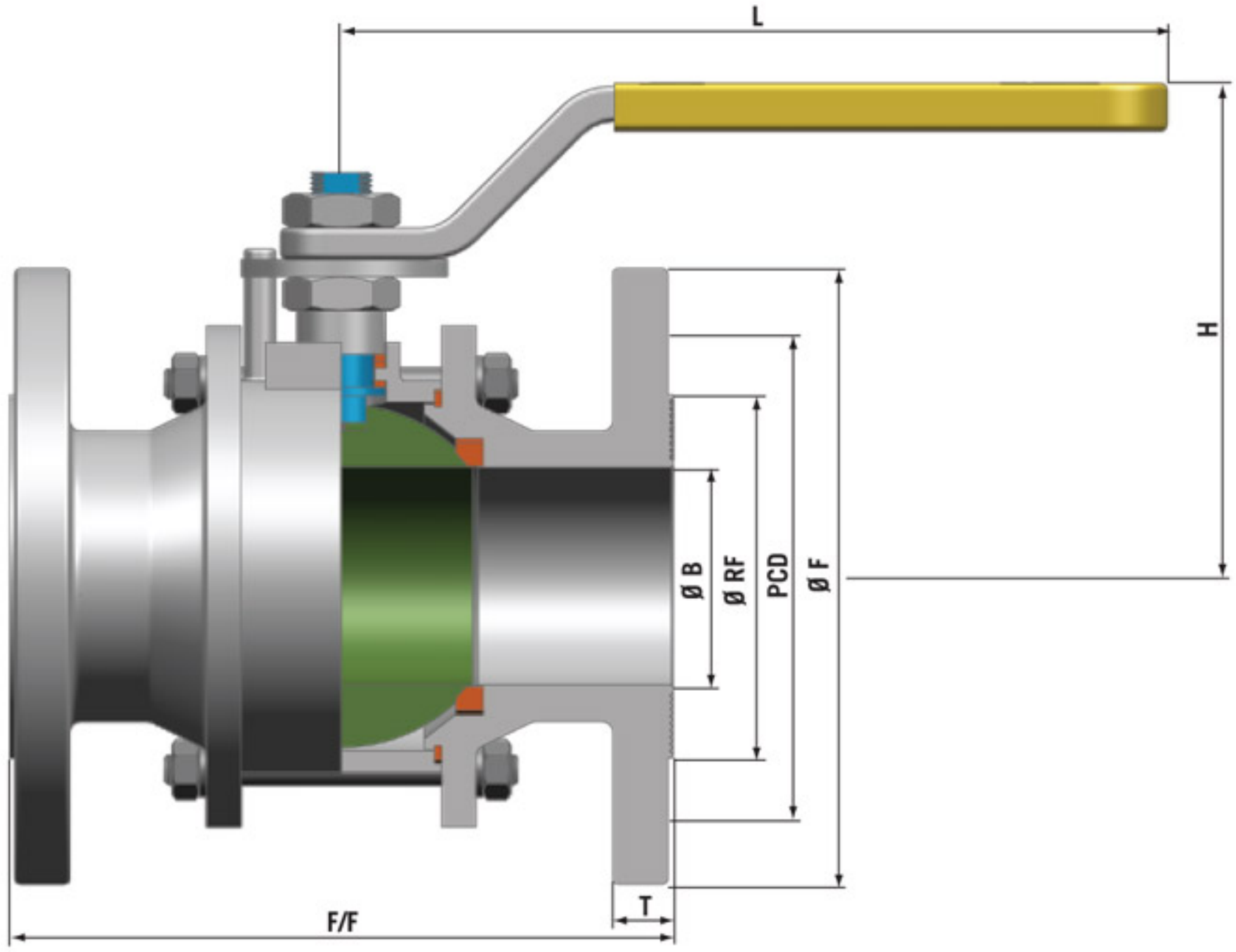
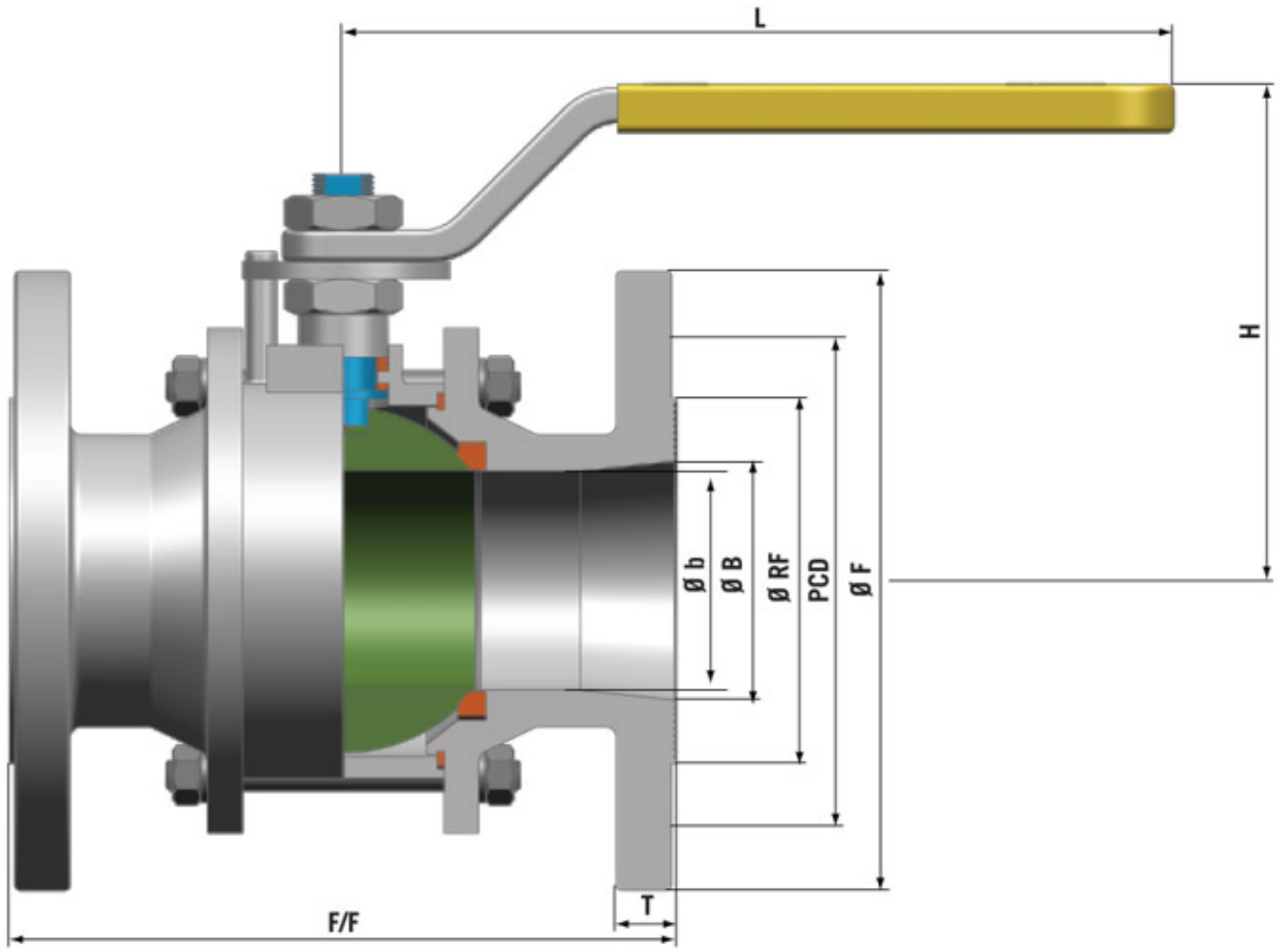
3pc Flanged End **Floating Valve** Full Port ASA 150# Class



Model No.: GM-400

Size	Ø B	F/F	H	L	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
15 mm	12.5	108	52	130	90	10	34.9	4	15.9	60.3
20 mm	19	117	57	130	100	10.9	42.9	4	15.9	69.9
25 mm	25.4	127	68	157	110	11.6	50.8	4	15.9	79.4
40 mm	38	165	90	228	125	14.7	73	4	15.9	98.4
50 mm	51	178	100	249	150	16.3	92.1	4	19.1	120.7
65 mm	64	190	110	300	180	17.9	104.8	4	19.1	139.7
80 mm	76	203	140	300	190	19.5	127	4	19.1	152.4
100 mm	102	229	180	351	230	24.3	157.2	8	19.1	190.5
150 mm	152	267	248	350	280	25.9	215.9	8	22.2	241.3

3pc Flanged End **Floating Valve** Reduce Port ASA 150# Class



Model No.: GM-401

Size	Ø B	Ø b	F/F	H	L	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	38	178	100	249	150	16.3	92.1	4	19.1	120.7
65 mm	64	51	190	110	300	180	17.9	104.8	4	19.1	139.7
80 mm	76	64	203	140	300	190	19.5	127	4	19.1	152.4
100 mm	102	76	229	180	351	230	24.3	157.2	8	19.1	190.5
150 mm	152	102	267	248	350	280	25.9	215.9	8	22.2	241.3

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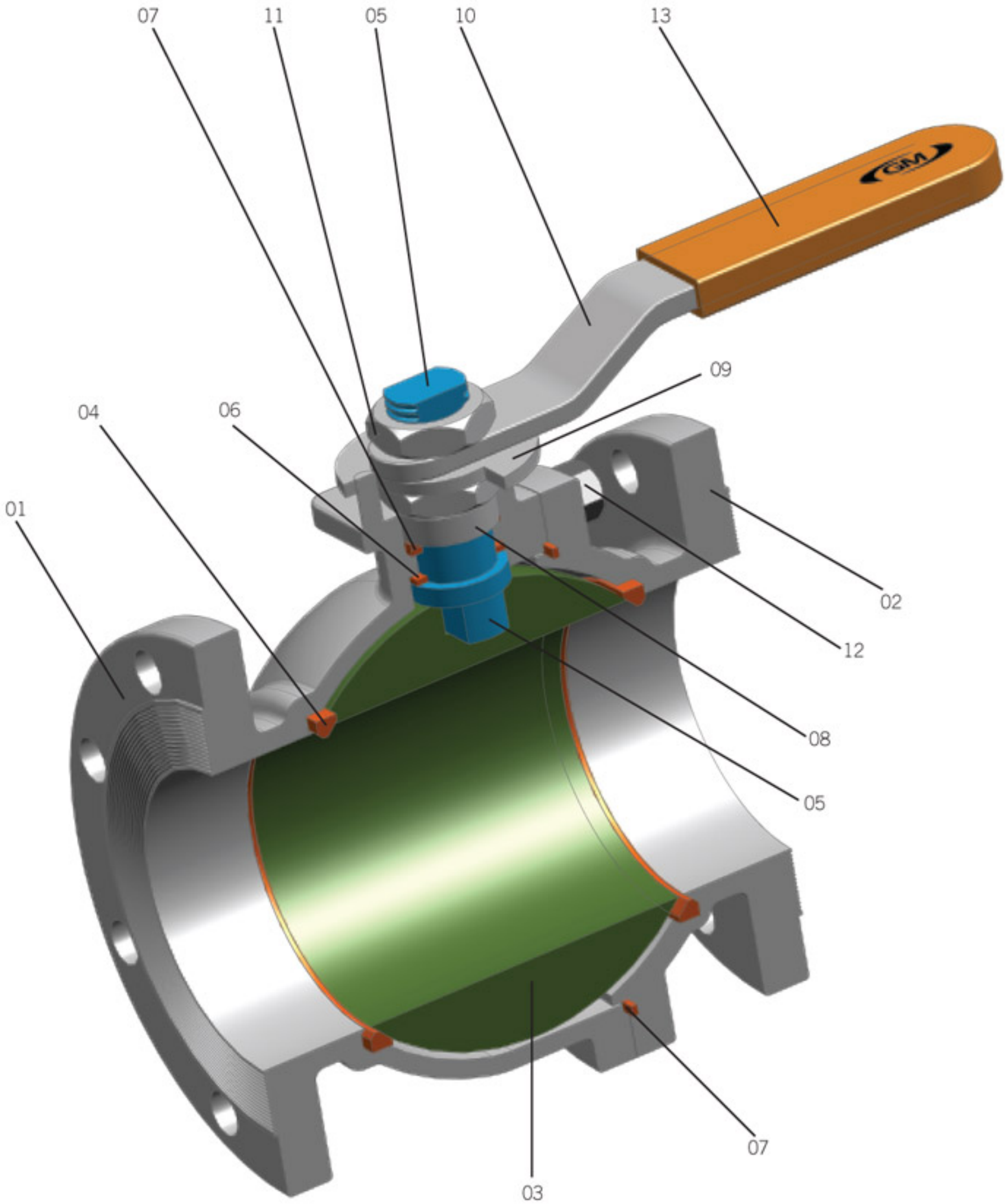
2 Piece Flanged End Floating **Ball Valve**



Applications

- Chemical & Process industries
- Refineries
- Petrochemicals & Fertilizer Plants
- Pharmaceuticals
- Oil Exploration
- Thermal & Nuclear Plants
- Food & Beverage industries
- Effluent Treatment & Sewerage Plants
- Water Treatment
- Cooling water & Water supply plants
- Mining Industries etc

Technical **Specifications**

2 Piece Flanged End Floating Ball Valve

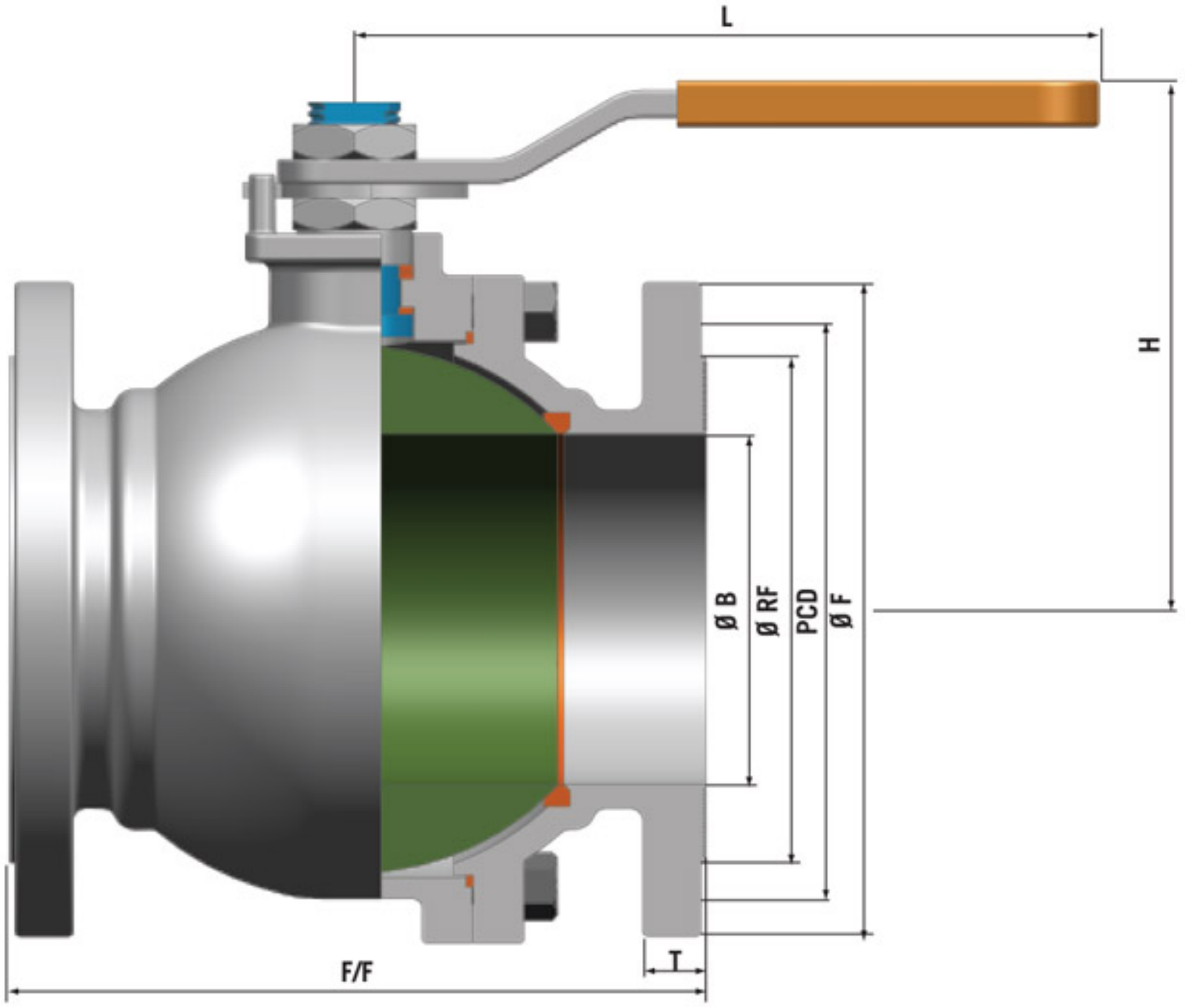
1	Body	ASTM A 216 GR. WCB	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
2	Side Piece	ASTM A 216 GR. WCB	ASTM A 351 GR. CF8/ CF8M	ASTM A 352 GR. LCB
3	Ball	ASTM A 351 GR. CF8	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
4	Body Seat	PTFE / RPTFE / PEEK / METAL & SECONDRY METAL TO METAL	PTFE / RPTFE / PEEK / METAL & SECONDRY METAL TO METAL	PTFE / RPTFE / PEEK / METAL & SECONDRY METAL TO METAL
5	Stem	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304/ASTM A 479 TYPE 316	ASTM A 276 TYPE 410
6	Stem seal	PTFE/GFT/GRAPHITE	PTFE/GFT/GRAPHITE	PTFE/GFT/GRAPHITE
7	Body seal	PTFE/GFT/PEEK/GRAPHITE	PTFE/GFT/PEEK/GRAPHITE	PTFE/GFT/PEEK/GRAPHITE
8	Gland bush	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304/ASTM A 479 TYPE 316	ASTM A 276 TYPE 410
9	Stopper	MS	SS 304/SS 316	MS
10	Lever	MS	SS	MS
11	Lever nut	ASTM A 194 GR. 2H	ASTM A 194 GR. 8 / 8M	ASTM A 194 GR. 2H
12	Body bolt	ASTM A 193 GR. B7	ASTM A 193 GR.B8 / B8M	ASTM A 320 GR. L7
13	Lever sleeve	PVC	PVC	PVC

Size Range	:	15 mm to 150 mm
Pressure Rating	:	ANSI Class 150 to Class 600
Connection	:	Flanged to ASME B16.5 (2" ~ 24") Butt-weld ends to ASME B16.25 Clamp ends on request.
Body Materials	:	Carbon steel, ITCS, Stainless steel, Duplex, Super Duplex, Inconel 625 and other special alloys.
Temp. Range	:	-196°C + 200°C (-320°F to + 392°F)
Design	:	ISO 172692 / API 6D / ASME B16.34
	:	ISO 14313 / ASME VIII
Face to Face	:	ASME B16.10 / API 6D
Fire Testing	:	API 607 / API 6FA / BS EN ISO 10497
Pressure Testing	:	API 6D
Certification**	:	EN 10204 / ISO 10474
	:	NACE MR 01-75 / ISO 15156 / MR 0103
Quality Assurance	:	ISO 9001 / API Monogram

**NACE compliance available on request.

G M ENGINEERING

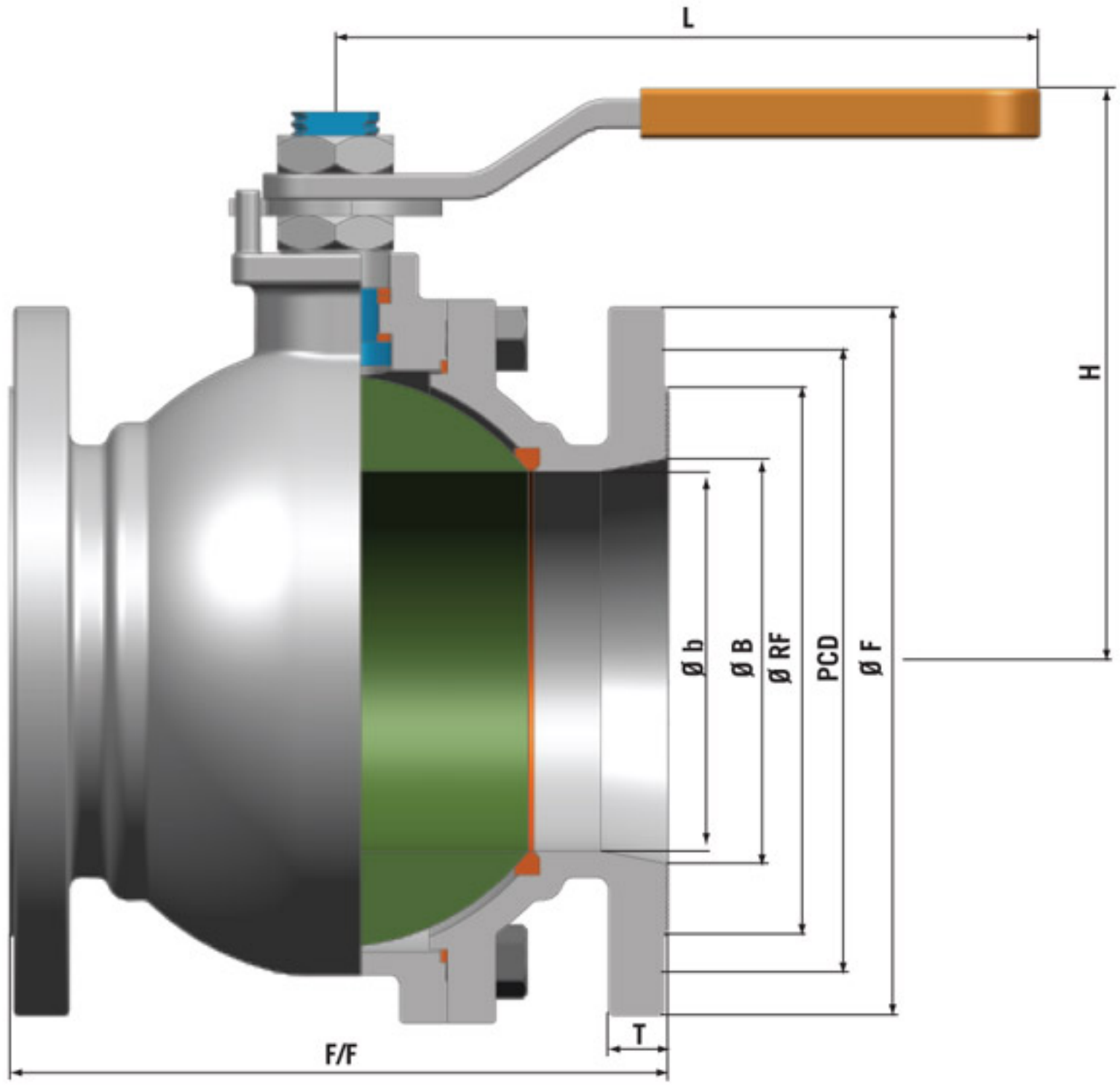
2pc Flanged End Floating **Ball Valve** Full Port ASA 150# Class



Model No.: GM-406

Size	Ø B	F/F	H	L	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
15 mm	12.5	108	52	130	90	10	34.9	4	15.9	60.3
20 mm	19	117	57	130	100	10.9	42.9	4	15.9	69.9
25 mm	25.4	127	68	157	110	11.6	50.8	4	15.9	79.4
40 mm	38	165	90	228	125	14.7	73	4	15.9	98.4
50 mm	51	178	100	249	150	16.3	92.1	4	19.1	120.7
65 mm	64	190	110	300	180	17.9	104.8	4	19.1	139.7
80 mm	76	203	140	300	190	19.5	127	4	19.1	152.4
100 mm	102	229	180	351	230	24.3	157.2	8	19.1	190.5
150 mm	152	267	248	350	280	25.9	215.9	8	22.2	241.3

2pc Flanged End Floating **Ball Valve** Reduce Port ASA 150# Class

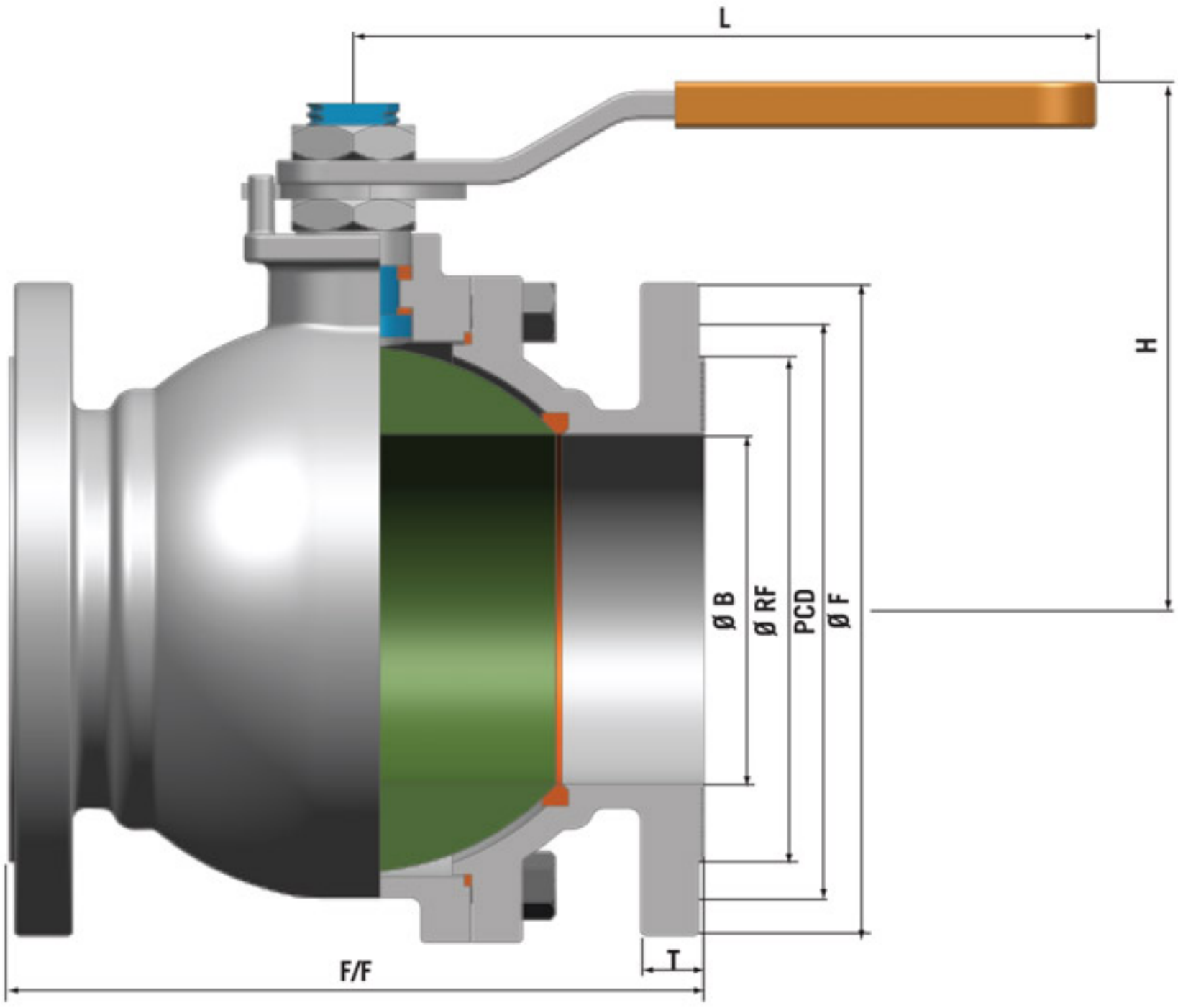


Model No.: GM-407

Size	Ø B	Ø b	F/F	H	L	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	38	178	100	249	150	16.3	92.1	4	19.1	120.7
65 mm	64	51	190	110	300	180	17.9	104.8	4	19.1	139.7
80 mm	76	64	203	140	300	190	19.5	127	4	19.1	152.4
100 mm	102	76	229	180	351	230	24.3	157.2	8	19.1	190.5
150 mm	152	102	267	248	350	280	25.9	215.9	8	22.2	241.3

G M ENGINEERING

2pc Flanged End Floating **Ball Valve** Full Port ASA 300# Class

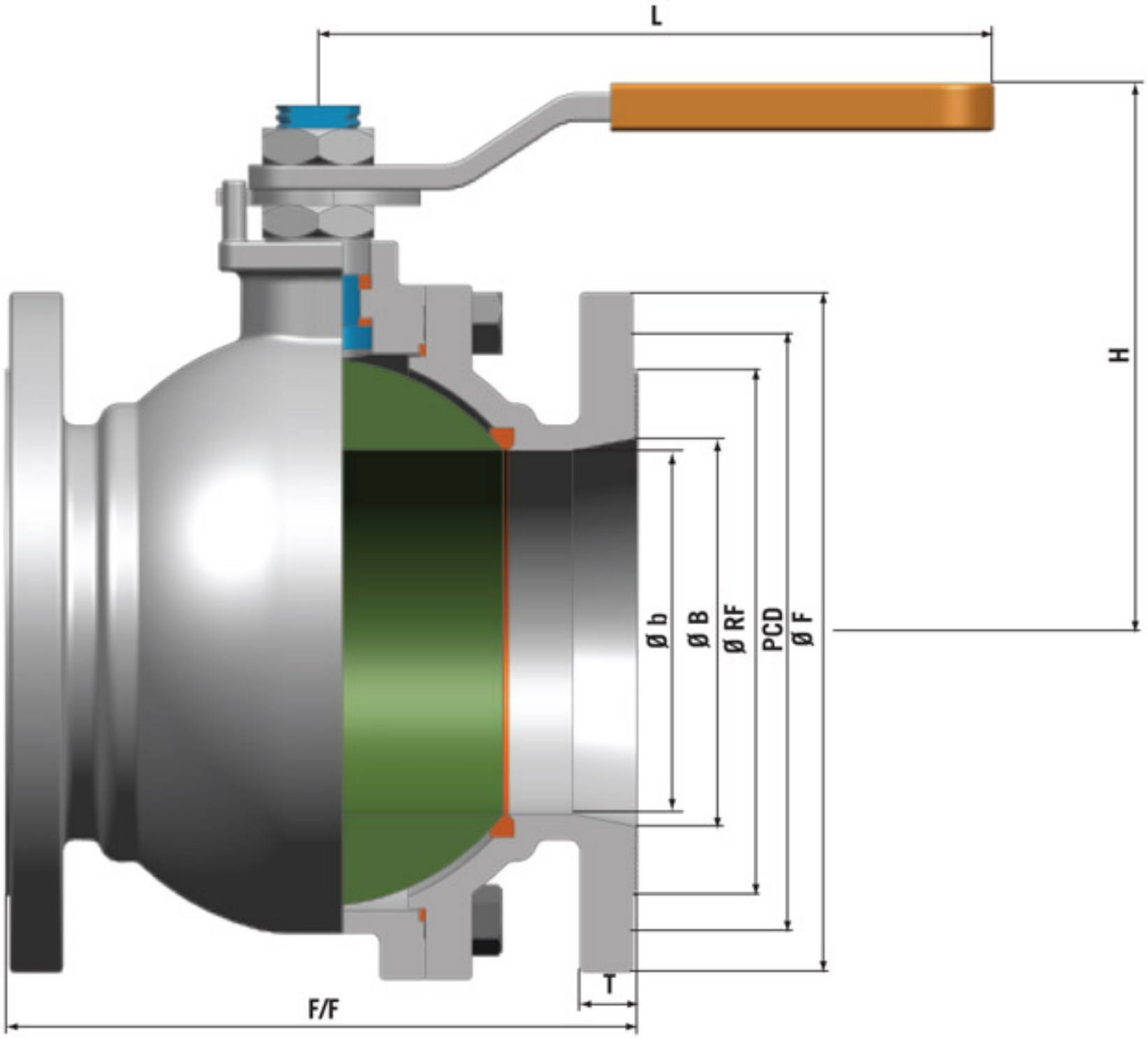


Model No.: GM-410

* Gear Operated

Size	Ø B	F/F	H	L	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
15 mm	12.5	140	55	155	95	14.5	34.9	4	15.9	66.7
20 mm	19	152	70	155	115	16	42.9	4	19.1	82.6
25 mm	25.4	165	75	155	125	17.9	50.8	4	19.1	88.9
40 mm	38	190	100	165	155	21.1	73	4	22.2	114.3
50 mm	51	216	150	165	165	22.7	92.1	8	19.1	127
65 mm	64	241	160	260	190	25.9	104.8	8	22.2	149.2
80 mm	76	282	175	470	210	29	127	8	22.2	168.3
100 mm	102	305	200	500	255	32.2	157.2	8	22.2	200
150 mm	152	403	300	*	320	37	215.9	12	22.2	269.9

2pc Flanged End Floating **Ball Valve** Reduce Port ASA 300# Class



Model No.: GM-411

* Gear Operated

Size	Ø B	Ø b	F/F	H	L	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	38	216	150	165	165	22.7	92.1	8	19.1	127
65 mm	64	51	241	160	260	190	25.9	104.8	8	22.2	149.2
80 mm	76	64	282	175	470	210	29	127	8	22.2	168.3
100 mm	102	76	305	200	500	255	32.2	157.2	8	22.2	200
150 mm	152	102	403	300	*	320	37	215.9	12	22.2	269.9

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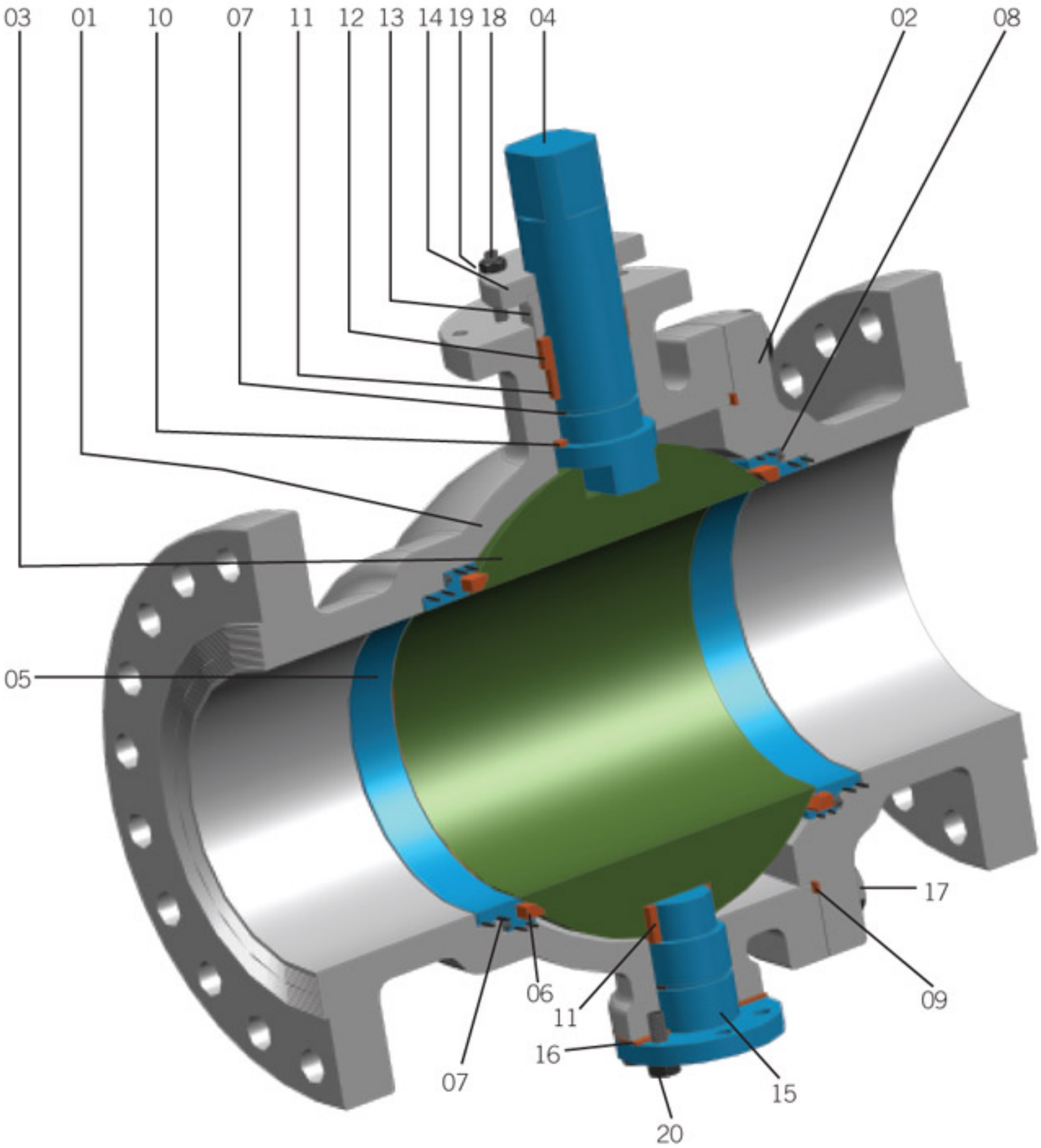
2 Piece Flanged End Trunion Mounted **Ball Valve**



Applications

- Chemical & Process industries
- Refineries
- Petrochemicals & Fertilizer Plants
- Pharmaceuticals
- Oil Exploration
- Thermal & Nuclear Plants
- Food & Beverage industries
- Effluent Treatment & Sewerage Plants
- Water Treatment
- Cooling water & Water supply plants
- Mining Industries etc

Technical **Specifications**

2 Pcs. Trunion Ball Valve

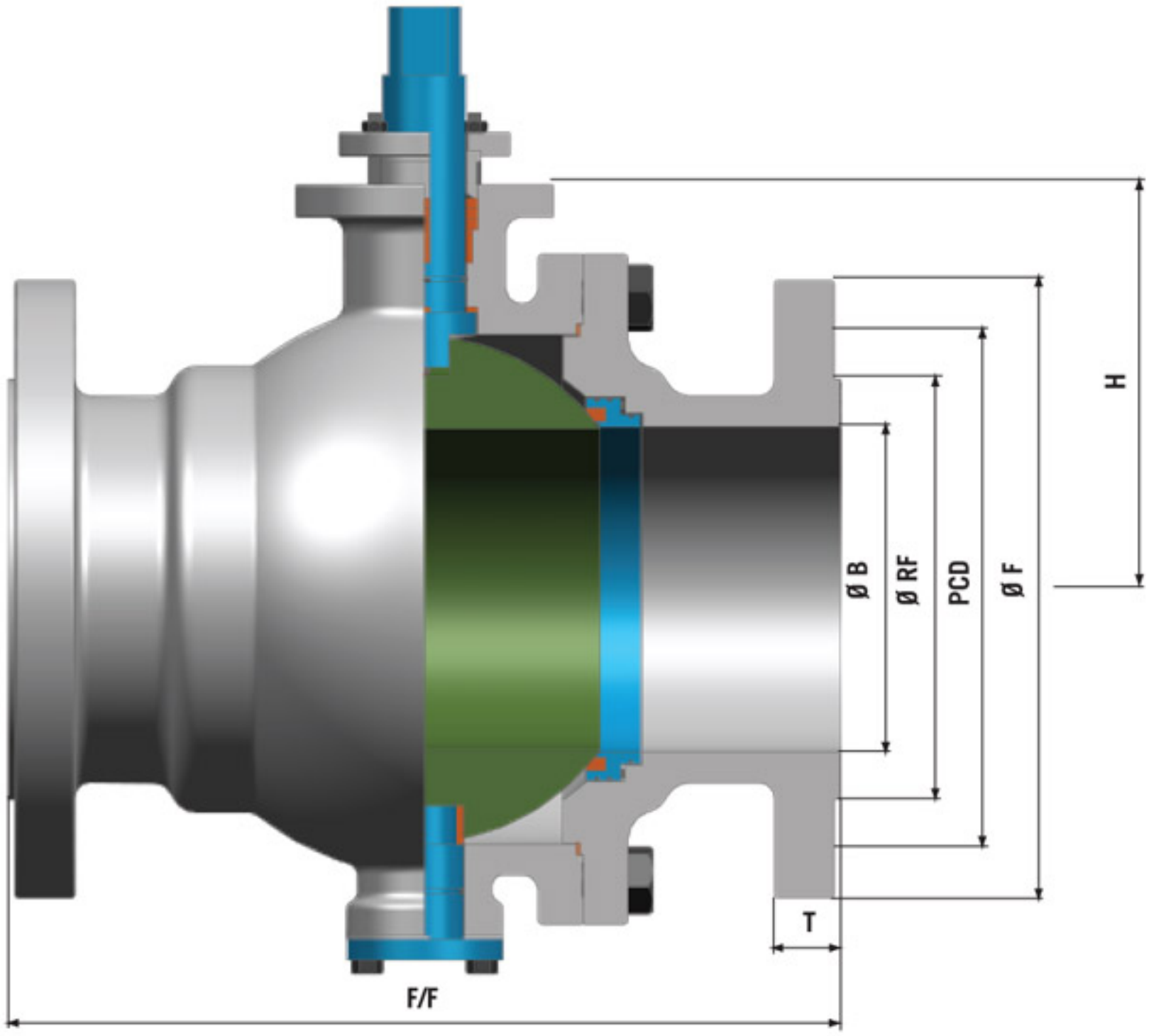
1	Body	ASTM A 216 GR. WCB	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
2	Side piece	ASTM A 216 GR. WCB	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
3	Ball	ASTM A 351 GR. CF8	ASTM A 351 GR. CF8/CF8M	ASTM A 352 GR. LCB
4	Stem	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304 / 316	ASTM A 276 TYPE 410
5	Seat retainer	ASTM A 276 TYPE 410 ASTM A 216 GR. WCB	"ASTM A 479 TYPE 304 / 316 ASTM A 351 GR.CF8/CF8M"	ASTM A 276 TYPE 410 ASTM A 352 GR. LCB
6	Body seat	PTFE / RTFE / PEEK / ACETAL RESIN / GLASS FILLED PTFE / METAL & SECONDY METAL TO METAL	PTFE / RTFE / PEEK / ACETAL RESIN GLASS FILLED PTFE / METAL &SECONDY METAL TO METAL	PTFE / RTFE / PEEK / ACETAL RESIN GLASS FILLED PTFE / METAL & SECONDY METAL TO METAL
7	O' Ring	EPDM / VITON / SILICON	EPDM / VITON / SILICON	EPDM / VITON / SILICON
8	Spring	S.S / ENCONAL	S.S / ENCONAL	S.S / ENCONAL
9	Body seal	PTFE/GLASS FILL PTFE/PEEK/GRAPHITE	PTFE/GLASS FILL PTFE/PEEK/GRAPHITE	PTFE/GLASS FILL PTFE/PEEK/GRAPHITE
10	Stem seal	PTFE/GLASS FILL PTFE/GRAPHITE	PTFE/GLASS FILL PTFE/GRAPHITE	PTFE/GLASS FILL PTFE/GRAPHITE
11	Bearing bush	PTFE/BRONZE	PTFE/BRONZE	PTFE/BRONZE
12	Gland packing	PTFE/GREFOIL	PTFE/GREFOIL	PTFE/GREFOIL
13	Gland bush	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304 /ASTM A 479 TYPE 316	ASTM A 276 TYPE 410
14	Gland flange	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304 /ASTM A 479 TYPE 316	ASTM A 276 TYPE 410
15	Trunion	ASTM A 276 TYPE 410	ASTM A 479 TYPE 304 /ASTM A 479 TYPE 316	ASTM A 276 TYPE 410
16	Trunion gasket	PTFE	PTFE	PTFE
17	Body bolt	ASTM A 193 GR. B7	ASTM A 193 GR.B8 / B8M	ASTM A 320 GR. L7
18	Gland stud	ASTM A 193 GR. B7	ASTM A 193 GR.B8 / B8M	ASTM A 320 GR. L7
19	Gland nut	ASTM A 194 GR. 2H	ASTM A 194 GR.8 / 8M	ASTM A 194 GR. 4
20	Trunion bolt	ASTM A 193 GR. B7	ASTM A 193 GR.B8 / B8M	ASTM A 320 GR. L7

Size Range	:	50 mm to 300 mm
Pressure Rating	:	ANSI Class 150 to Class 600
Connection	:	Flanged to ASME B16.5 (2" ~ 24") Butt-weld ends to ASME B16.25 Clamp ends on request.
Body Materials	:	Carbon steel, ITCS, Stainless steel, Duplex, Super Duplex, Inconel 625 and other special alloys.
Temp. Range	:	-196°C + 200°C (-320°F to + 392°F)
Design	:	ISO 172692 / API 6D / ASME B16.34
	:	ISO 14313 / ASME VIII
Face to Face	:	ASME B16.10 / API 6D
Fire Testing	:	API 607 / API 6FA / BS EN ISO 10497
Pressure Testing	:	API 6D
Certification**	:	EN 10204 / ISO 10474
	:	NACE MR 01-75 / ISO 15156 / MR 0103
Quality Assurance	:	ISO 9001 / API Monogram

**NACE compliance available on request.

G M ENGINEERING

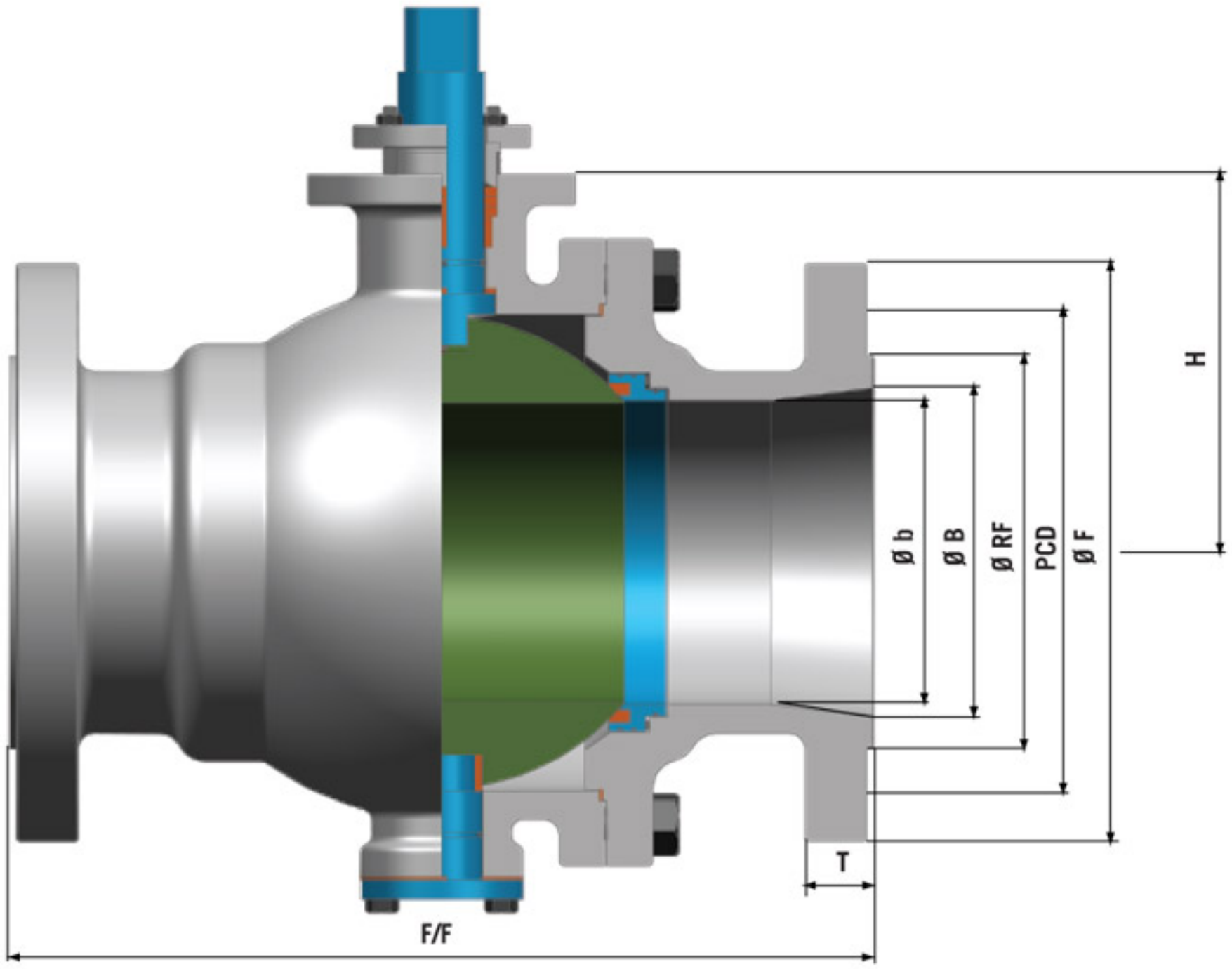
2pc Flanged End Trunion Mounted **Ball Valve** Full Port ASA 150# Class



Model No.: GM-408

Size	Ø B	F/F	H	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	178	100	150	16.3	92.1	4	19.1	120.7
65 mm	64	190	110	180	17.9	104.8	4	19.1	139.7
80 mm	76	203	140	190	19.5	127	4	19.1	152.4
100 mm	102	229	180	230	24.3	157.2	8	19.1	190.5
150 mm	152	267	248	280	25.9	215.9	8	22.2	241.3
200 mm	203	457-L	300	345	29	269.9	8	22.2	298.5
250 mm	254	533-L	360	405	30.6	323.8	12	25.4	362
300 mm	305	610-L	500	485	32.2	381	12	25.4	431.8
350 mm	336	686-L	600	535	35.4	412.8	12	28.6	476.3
400 mm	387	762-L	675	595	37	469.9	16	28.6	539.8
450 mm	438	864-L	700	635	40.1	533.4	16	31.8	577.9
500 mm	489	914-L	750	700	43.3	584.2	20	31.8	635
600 mm	590	1067-L	800	815	48.1	692.2	20	34.9	749.3

2pc Flanged End Trunion Mounted **Ball Valve** Reduce Port ASA 150# Class

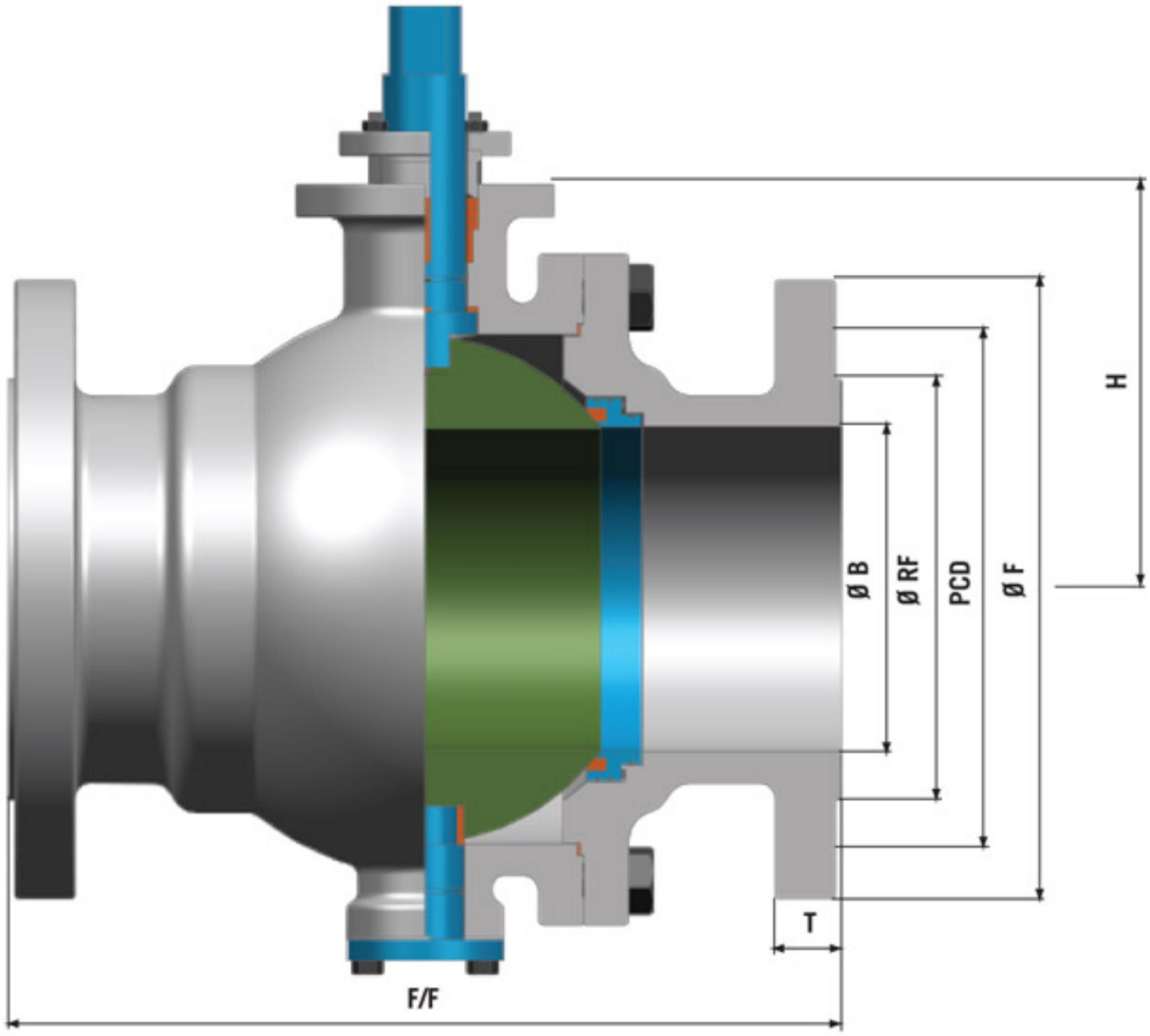


Model No.: GM-409

Size	Ø B	Ø b	F/F	H	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	38	178	100	150	16.3	92.1	4	19.1	120.7
65 mm	64	51	190	110	180	17.9	104.8	4	19.1	139.7
80 mm	76	64	203	140	190	19.5	127	4	19.1	152.4
100 mm	102	76	229	180	230	24.3	157.2	8	19.1	190.5
150 mm	152	102	267	248	280	25.9	215.9	8	22.2	241.3
200 mm	203	152	457-L	300	345	29	269.9	8	22.2	298.5
250 mm	254	203	533-L	360	405	30.6	323.8	12	25.4	362
300 mm	305	254	610-L	500	485	32.2	381	12	25.4	431.8
350 mm	336	305	686-L	600	535	35.4	412.8	12	28.6	476.3
400 mm	387	336	762-L	675	595	37	469.9	16	28.6	539.8
450 mm	438	387	864-L	700	635	40.1	533.4	16	31.8	577.9
500 mm	489	438	914-L	750	700	43.3	584.2	20	31.8	635
600 mm	590	489	1067-L	800	815	48.1	692.2	20	34.9	749.3

G M ENGINEERING

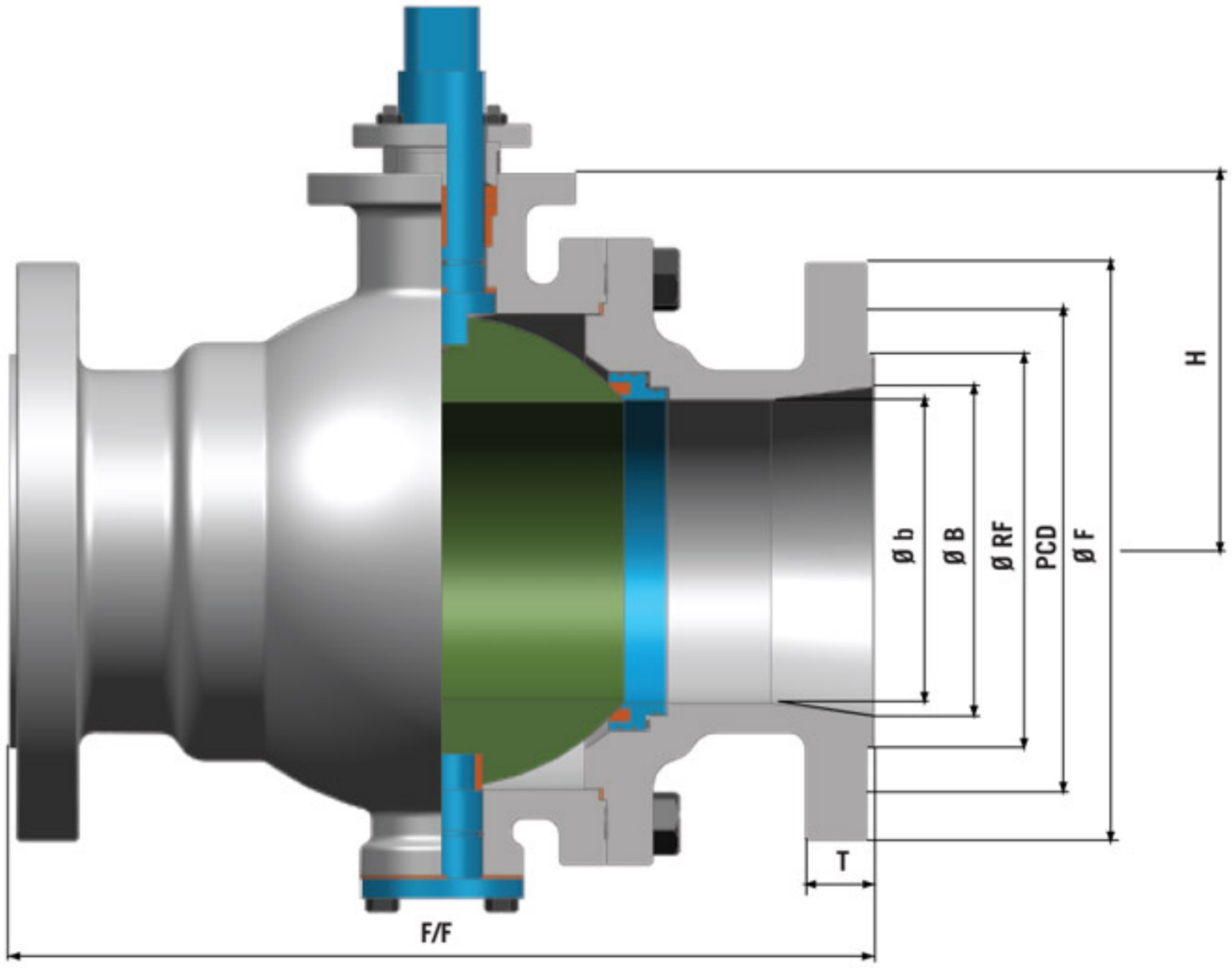
2pc Flanged End Trunion Mounted **Ball Valve** Full Port ASA 300# Class



Model No.: GM-412

Size	Ø B	F/F	H	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	216	150	165	22.7	92.1	8	19.1	127
65 mm	64	241	160	190	25.9	104.8	8	22.2	149.2
80 mm	76	282	175	210	29	127	8	22.2	168.3
100 mm	102	305	200	255	32.2	157.2	8	22.2	200
150 mm	152	403	300	320	37	215.9	12	22.2	269.9
200 mm	203	419	340	380	41.7	269.9	12	25.4	330.2
250 mm	254	457	410	445	48.1	323.8	16	28.6	387.4
300 mm	305	648-L	490	520	51.3	381	16	31.8	450.8
350 mm	336	762-L	600	585	54.4	412.8	20	31.8	514.8
400 mm	387	838-L	640	650	57.6	469.9	20	34.9	571.5
450 mm	438	914-L	700	710	60.8	533.4	24	34.9	628.6
500 mm	489	991-L	750	775	64	584.2	24	34.9	685.8
600 mm	590	1143-L	800	915	70.3	692.2	24	41.3	812.8

2pc Flanged End Trunion Mounted **Ball Valve** Reduce Port ASA 300# Class

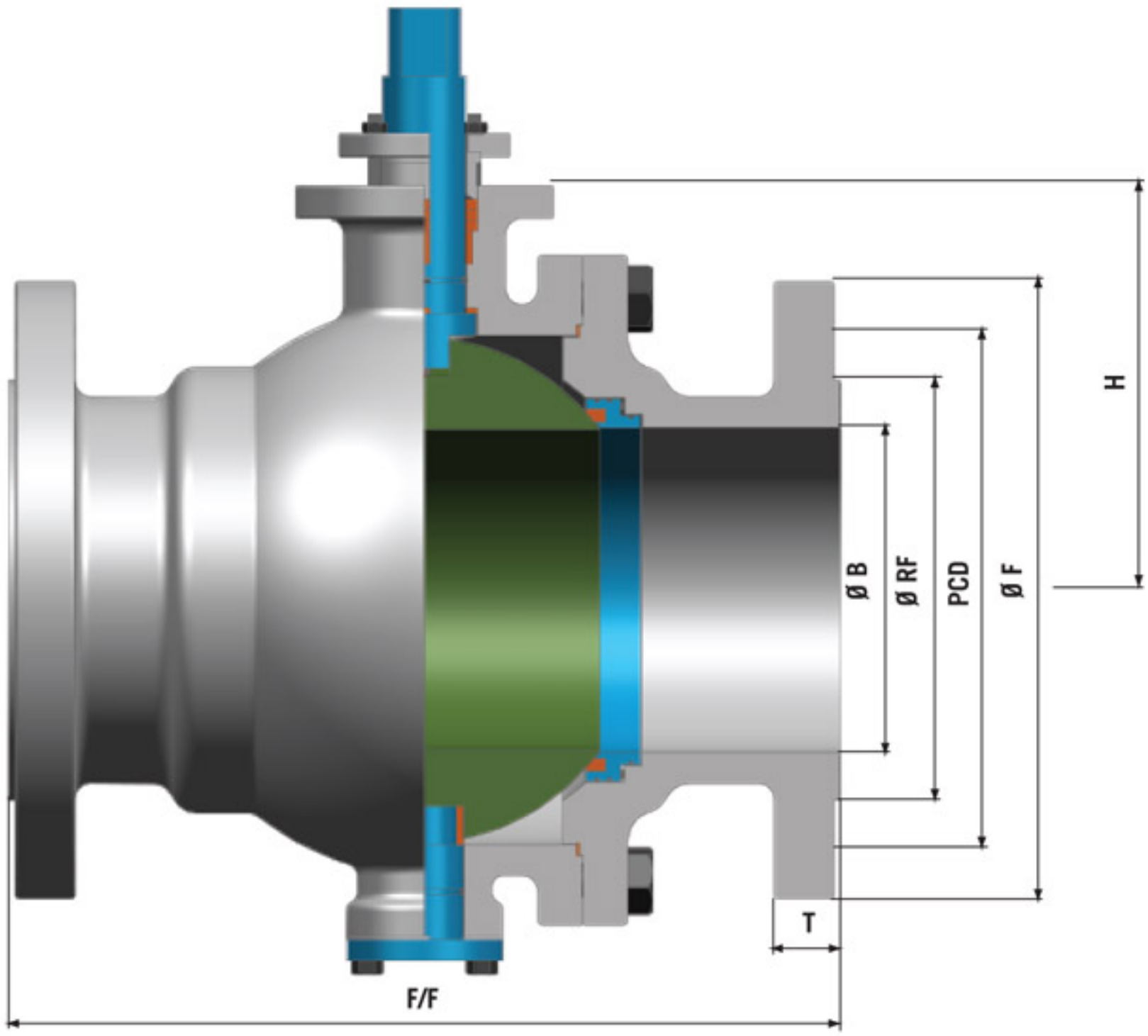


Model No.: GM-413

Size	Ø B	Ø b	F/F	H	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
50 mm	51	38	216	150	165	22.7	92.1	8	19.1	127
65 mm	64	51	241	160	190	25.9	104.8	8	22.2	149.2
80 mm	76	64	282	175	210	29	127	8	22.2	168.3
100 mm	102	76	305	200	255	32.2	157.2	8	22.2	200
150 mm	152	102	403	300	320	37	215.9	12	22.2	269.9
200 mm	203	152	419	340	380	41.7	269.9	12	25.4	330.2
250 mm	254	203	457	410	445	48.1	323.8	16	28.6	387.4
300 mm	305	254	648-L	490	520	51.3	381	16	31.8	450.8
350 mm	336	305	762-L	600	585	54.4	412.8	20	31.8	514.5
400 mm	387	336	838-L	640	650	57.6	469.9	20	34.9	571.5
450 mm	438	387	914-L	700	710	60.8	533.4	24	34.9	628.6
500 mm	489	438	991-L	750	775	64	584.2	24	34.9	685.8
600 mm	590	489	1143-L	800	915	70.3	692.2	24	41.3	812.8

G M ENGINEERING

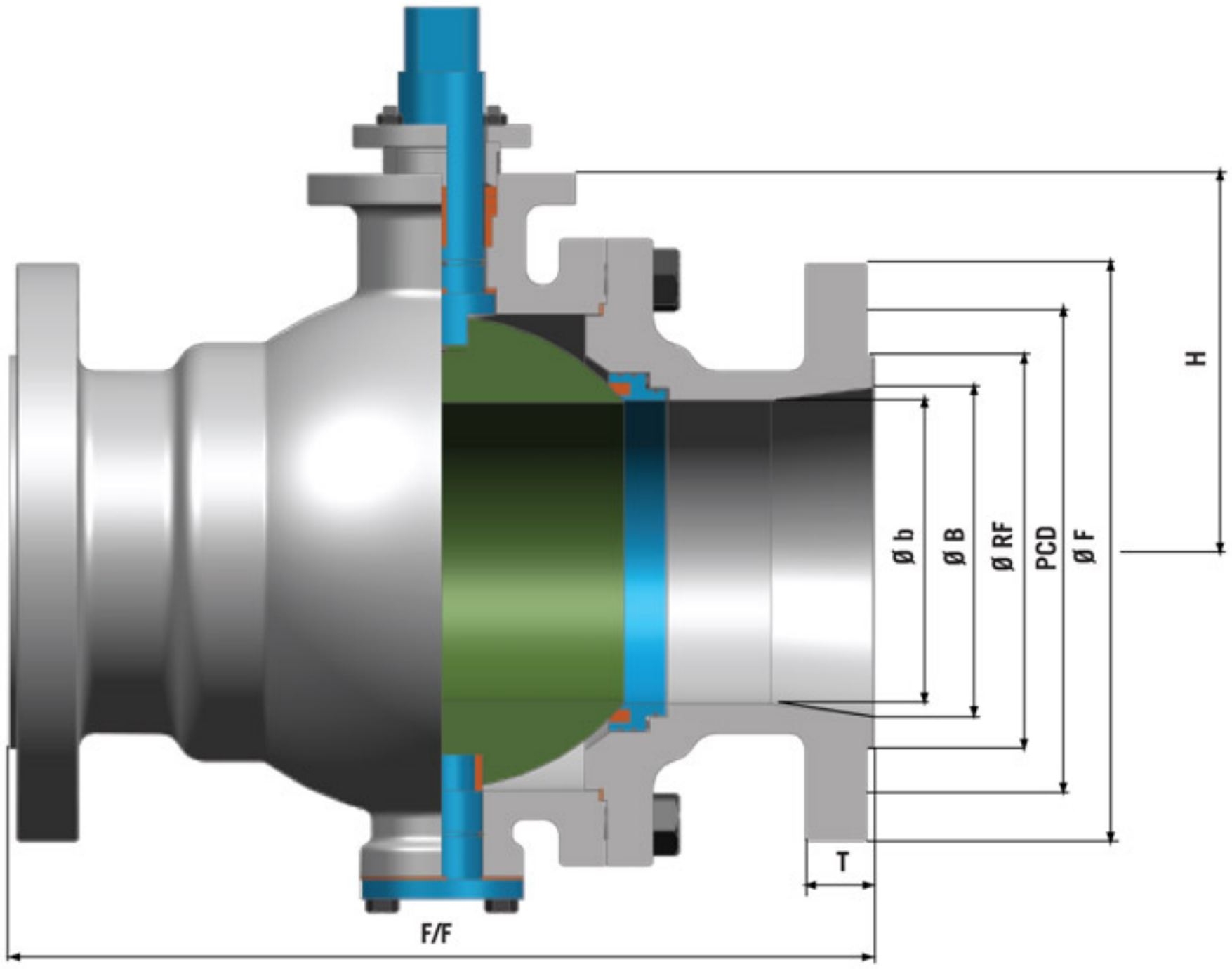
2pc Flanged End Trunion Mounted **Ball Valve** Full Port ASA 600# Class



Model No.: GM-422

Size	Ø B	F/F	H	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
100 mm	102	432	280	275	45.1	157.2	8	25.4	215.9
150 mm	152	559	340	355	54.7	215.9	12	28.6	292.1
200 mm	203	660	400	420	62.6	269.9	12	31.8	349.2
250 mm	254	787	470	510	70.5	323.8	16	34.9	431.8
300 mm	305	838	520	560	73.7	381	20	34.9	489
350 mm	336	889	600	605	76.9	412.8	20	38.1	527
400 mm	387	991	740	685	83.2	469.9	20	41.3	603.2
450 mm	438	1092	800	745	89.6	533.4	20	44.5	654
500 mm	489	1194	975	815	95.9	584.2	24	44.5	723.9
600 mm	590	1397	1030	940	108.6	692.2	24	50.8	838.2

2pc Flanged End Trunion Mounted **Ball Valve** Reduce Port ASA 600# Class



Model No.: GM-423

Size	Ø B	Ø b	F/F	H	Ø F	T	Ø R.F.	No. of Hole	Hole Ø	PCD
100 mm	102	76	432	280	275	45.1	157.2	8	25.4	215.9
150 mm	152	102	559	340	355	54.7	215.9	12	28.6	292.1
200 mm	203	152	660	400	420	62.6	269.9	12	31.8	349.2
250 mm	254	203	787	470	510	70.5	323.8	16	34.9	431.8
300 mm	305	254	838	520	560	73.7	381	20	34.9	489
350 mm	336	305	889	600	605	76.9	412.8	20	38.1	527
400 mm	387	336	991	740	685	83.2	469.9	20	41.3	603.2
450 mm	438	387	1092	800	745	89.6	533.4	20	44.5	654
500 mm	489	438	1194	975	815	95.6	584.2	24	44.5	723.9
600 mm	590	489	1397	1030	940	108.6	692.2	24	50.8	838.2

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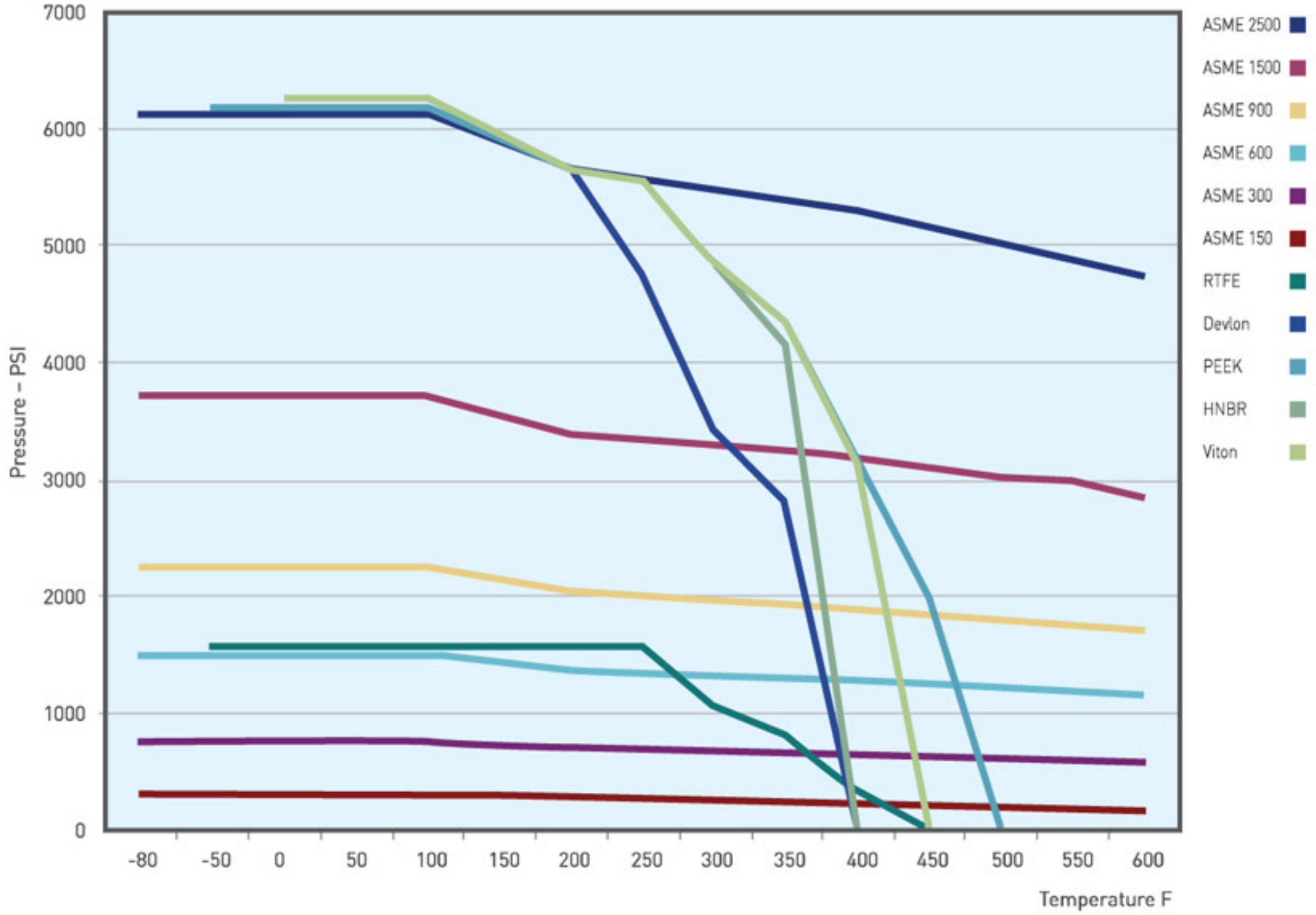
Temperature Pressure Graph



Flow Coefficients Cv Values

The flow coefficienty (Cv) of a valve is the rate of gallons per minute of water at 60 F through a fully opened valve at a pressure drop of 1 PSI across the valve.

Size	150	300	600
2	500	460	400
3 x 2	180	195	180
3	1350	1150	1050
4 x 3	545	535	550
4	2500	2200	1850
6 x 4	790	765	745
6	5300	5290	4460
8 x 6	1945	1945	2220
8	10500	9600	8730
10 x 8	4050	4040	4065
10	17500	16750	14250
12	26300	25500	22550
14	31850	30050	28400
16	43300	41700	38150
18	57300	55370	50950
20	74500	72300	65600
22	92600	88420	80279
24	112300	109150	98150

Opening Torques for soft seats

The operating torques are in foot pounds and are calculated based on soft seats, normal temperatures, and clean media.

Size	ISO5211	150		300		600	
		Full Port	Reduced Port	Full Port	Reduced Port	Full Port	Reduced Port
.5	F03/F04	5	5	7	7	13	/
.75		7	7	12	12	18	/
1	F05/F06	12	12	18	18	30	/
1.5		26	26	37	37	67	/
2	F10	37	37	52	52	81	/
2.5		59	59	74	74	122	/
3	F10/F12	89	89	118	118	221	221
4		133	133	207	207	443	443
6		177	177	738	738	1438	1438
8	F14	708	708	1549	1549	/	/
10	F16	1328	1328	2508	2508	/	/

NOTES

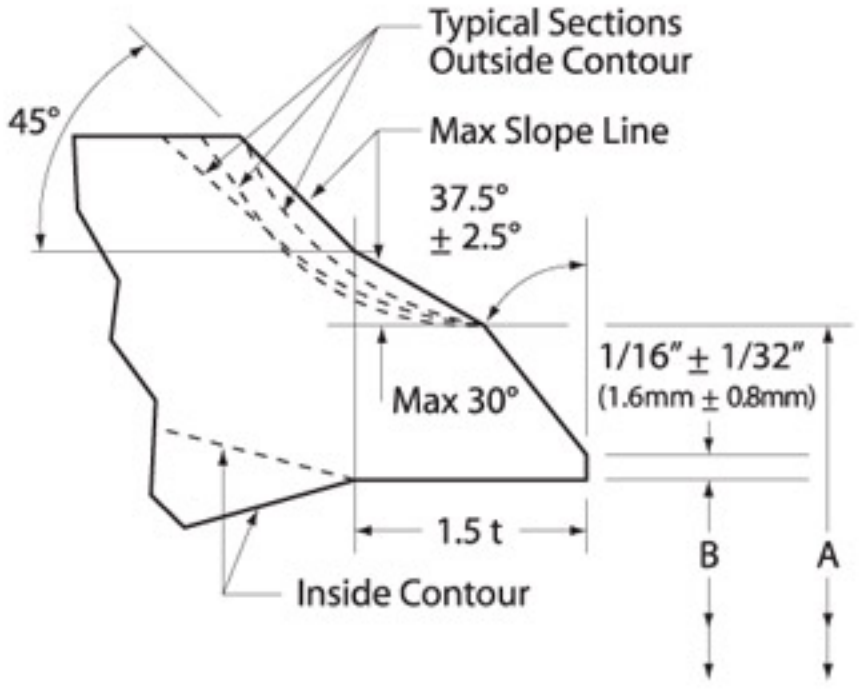
1	Torque may change with different mediums and trim materials.
2	All valve are at normal temperature with PTFE seats for Class 150 and 300 lbs. Nylon seats for class 600 through 1500.
3	All torques are at maximum differential. Safety factory not included.

G M ENGINEERING

Butt-welding Dimension - ANSI B16.25

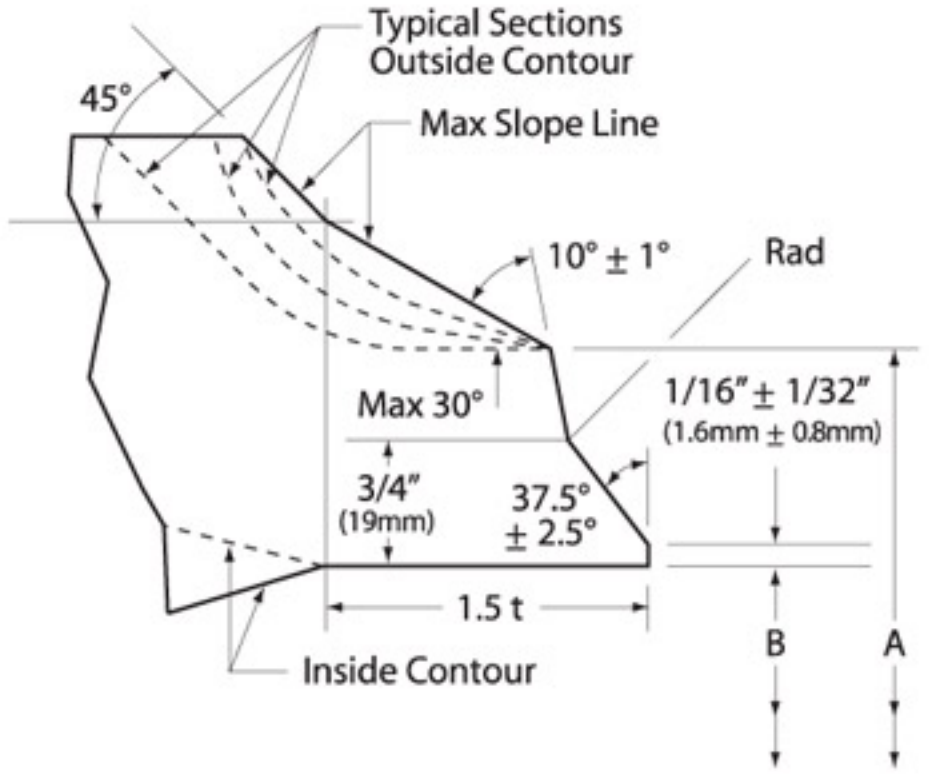
Plain Bevel Butt-welding End for Pipe Wall Thickness is 7/8" (22.23mm) o9r less.

Welding end details for cast components for use without backing ring or with split backing ring.



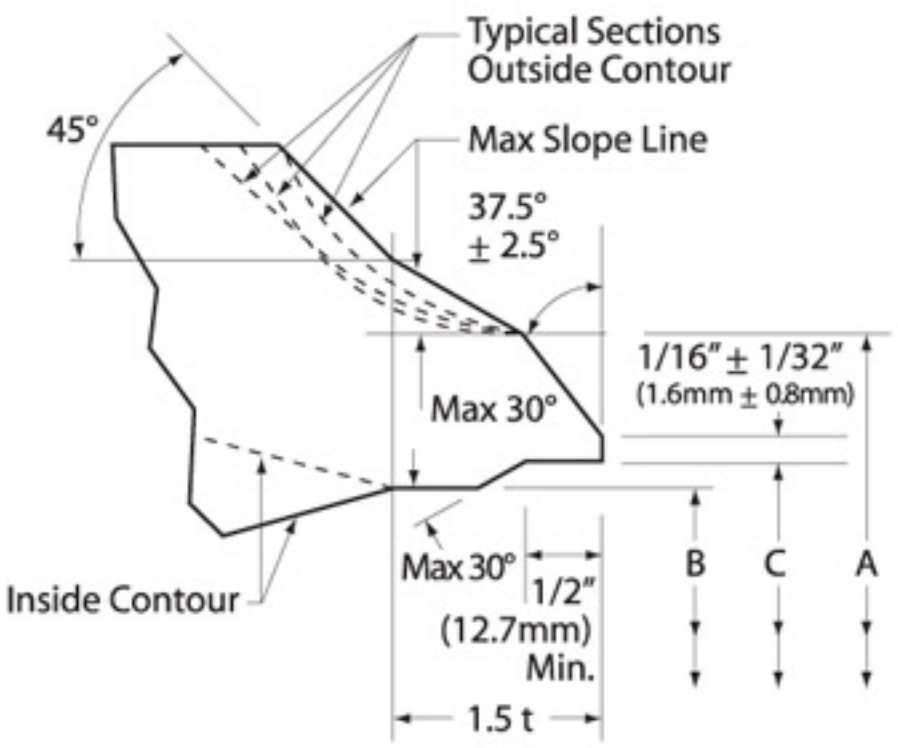
Compound Bevel Butt-welding End for Pipe wall thickness greater than 7/8" (22.23mm).

Welding end details for cast components for use without backing ring or with split backing ring.



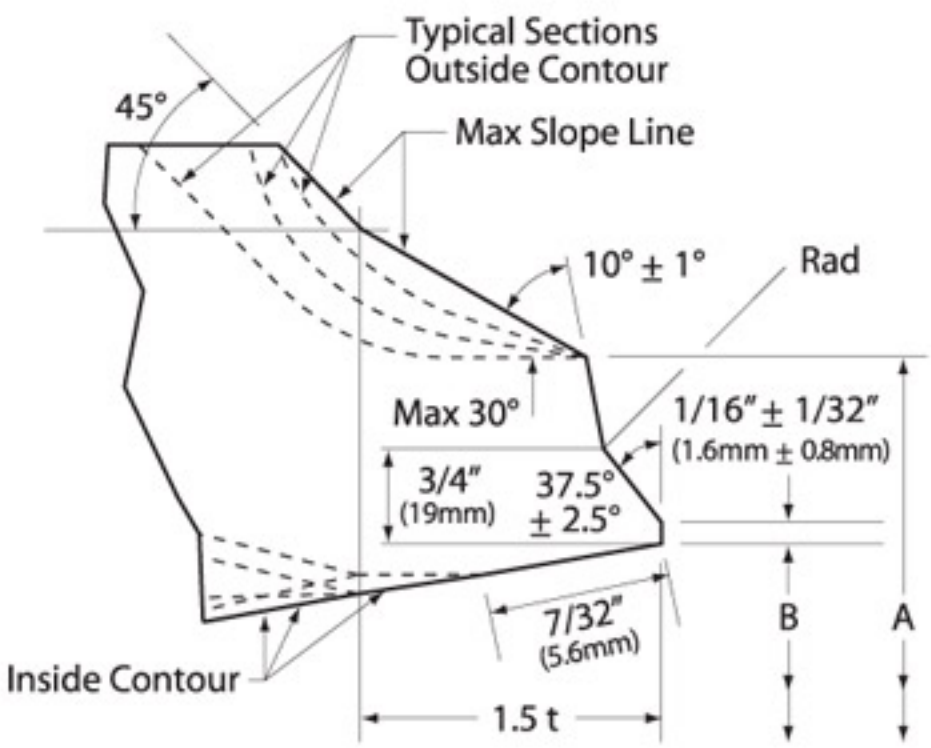
Plain Bevel Butt-welding End for Pipe Wall Thickness is 7/8" (22.23mm) o9r less.

Welding end details for cast components for use with continuous recrangular or tapered backing ring.



Compound Bevel Butt-welding End for Pipe Wall Thickness greater than 7/8" (22.23mm).

Welding end details for cast components for use with continuous rectangular or tapered backing ring.



Normal Pipe Size	Schedule Number or Wall	Outside Diameter (Cast Steel Valves) A		Nominal Inside Diameter B		Machined Inside Diameter C		Nominal Wall Thickness D	
		Inches	mm	Inches	mm	Inches	mm	Inches	mm
3	xxs	3-19/32	91.282	2.300	58.42	2.409	61.19	0.600	15.24
4	xxs	4-5/8	117.48	3.152	80.06	3.279	83.29	0.674	17.12
5	160	5-11/16	144.46	4.313	109.55	4.428	112.47	0.625	15.88
	xxs			4.063	103.20	4.209	106.91	0.750	19.05
6	120	6-25/32	172.34	5.501	139.72	5.600	142.24	0.562	14.27
	160			5.189	131.80	5.327	135.31	0.719	18.26
	xxs			4.897	124.38	5.072	128.83	0.864	21.95
8	100	8-23/32	223.04	7.439	188.93	7.546	191.67	0.594	15.09
	120			7.189	182.60	7.327	186.11	0.719	18.26
	140			7.001	177.83	7.163	181.94	0.812	20.62
	xxs			6.875	174.63	7.053	179.15	0.875	22.23
	160			6.813	173.05	6.998	177.75	0.960	23.01
10	50	10-15/16	277.81	9.564	242.93	9.671	245.64	0.594	15.09
	100			9.314	236.58	9.452	240.08	0.719	18.26
	120			9.064	230.23	9.234	234.54	0.844	21.44
	140			8.750	222.25	8.959	227.56	1.000	25.40
	160			8.500	215.90	8.740	222.00	1.125	28.58
12	60	12-31/32	329.41	11.626	295.30	11.725	297.82	0.562	14.27
	80			11.376	288.95	11.507	292.28	0.688	17.48
	100			11.064	281.03	11.234	284.34	0.844	21.44
	120			10.750	273.05	10.959	278.36	1.000	25.40
	140			10.500	266.70	10.740	272.80	1.125	28.58
	160			10.126	257.20	10.413	264.49	1.312	33.32
14	60	14-1/4	361.95	12.814	352.48	12.921	328.19	0.594	15.09
	80			12.500	317.50	12.646	321.21	0.750	19.05
	100			12.126	308.00	12.319	312.90	0.938	23.83
	120			11.814	300.08	12.06	305.97	1.094	27.79
	140			11.500	292.10	11.771	298.98	1.250	31.75
	160			11.188	284.18	11.498	292.05	1.406	35.71
16	60	16-1/4	412.75	14.688	373.08	14.811	376.20	0.656	16.66
	80			14.314	363.58	14.484	367.89	0.844	21.44
	100			13.938	354.03	14.155	259.54	1.031	26.19
	120			13.564	344.53	13.827	351.21	1.219	30.96
	140			13.124	333.35	13.442	341.43	1.438	36.53
	160			12.814	325.48	13.171	334.54	1.594	40.49
18	40	18-9/32	464.34	16.876	428.65	16.975	431.17	0.562	14.27
	60			16.500	419.10	16.646	422.81	0.750	19.05
	80			16.126	409.60	16.319	414.50	0.938	23.83
	100			15.688	398.48	15.936	404.50	1.156	29.36
	120			15.250	387.35	15.553	395.05	1.375	34.93
	140			14.876	377.85	15.225	386.72	1.562	39.67
	160			14.438	366.73	14.842	376.99	1.781	45.24
20	40	20-5/16	515.94	18.814	477.88	18.921	480.59	0.594	15.09
	60			18.376	466.75	18.538	470.87	0.812	20.62
	80			17.938	455.63	18.155	461.14	1.031	26.19
	100			17.438	442.93	17.717	450.14	1.281	32.54
	120			17.000	431.80	17.334	440.28	1.500	38.10
	140			16.500	419.10	16.896	429.16	1.750	44.45
	160			16.064	408.03	16.515	419.48	1.969	50.01
24	30	24-3/8	619.13	22.876	581.05	22.975	583.57	0.562	14.27
	40			22.626	574.70	22.757	578.03	0.688	17.48
	60			22.064	560.43	22.265	565.53	0.969	24.61
	80			21.564	547.73	21.827	554.41	1.219	30.96
	100			20.938	531.83	21.280	540.51	1.531	38.89
	120			20.376	517.55	20.788	528.02	1.812	46.02
	140			19.876	504.85	20.350	516.89	2.062	52.37
	160			19.314	490.58	19.859	504.42	2.344	59.54

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Pressure **Temperatures Ratings ASME B16.34-2009**

150

Temp. F	A105	WCB	LF2	WCC	LCB	WC6	LCC	C5	C12	C12A	316	CF8M	F51	F53
-20 to 100	288	288	288	290	265	290	290	290	290	290	275	275	290	290
200	260	260	260	260	255	260	260	260	260	260	235	235	260	260
300	230	230	230	230	230	230	230	230	230	230	215	215	230	230
400	200	200	200	200	200	200	200	200	200	200	195	195	200	200
500	170	170	170	170	170	170	170	170	170	170	170	170	170	170
600	140	140	140	140	140	140	140	140	140	140	140	140	140	140
650	125	125	125	125	125	125	125	125	125	125	125	125	125	125
700	110	110	110	110	110	110	110	110	110	110	110	110	110	110
750	95	95	95	95	95	95	95	95	95	95	95	95	95	95
800	80	80	80	80	80	80	80	80	80	80	80	80	/	/
850	65	65	65	65	65	65	65	65	65	65	65	65	/	/
900	50	50	50	50	50	50	50	50	50	50	50	50	/	/
950	35	35	35	35	35	35	35	35	35	35	35	35	/	/
1000	20	20	20	20	20	20	20	20	20	20	20	20	/	/
1050	/	/	/	/	/	20	/	20	20	20	20	20	/	/
1100	/	/	/	/	/	20	/	20	20	20	20	20	/	/
1150	/	/	/	/	/	20	/	20	20	20	20	20	/	/
1200	/	/	/	/	/	15	/	15	20	20	20	20	/	/
1250	/	/	/	/	/	/	/	/	/	/	20	20	/	/
1300	/	/	/	/	/	/	/	/	/	/	20	20	/	/
1350	/	/	/	/	/	/	/	/	/	/	20	20	/	/
1400	/	/	/	/	/	/	/	/	/	/	20	20	/	/
1450	/	/	/	/	/	/	/	/	/	/	20	20	/	/
1500	/	/	/	/	/	/	/	/	/	/	15	15	/	/

300

Temp. F	A105	WCB	LF2	WCC	LCB	WC6	LCC	C5	C12	C12A	316	CF8M	F51	F53
-20 to 100	740	740	740	750	695	750	750	750	750	750	720	720	750	750
200	680	680	680	750	660	750	750	750	750	750	620	620	745	745
300	655	655	655	730	640	720	730	730	730	730	560	560	665	665
400	635	635	635	705	615	695	705	705	705	705	515	515	615	615
500	605	605	605	665	585	665	665	665	665	665	480	480	580	580
600	570	570	570	605	550	605	605	605	605	605	450	450	555	555
650	550	550	550	590	535	590	590	590	590	590	440	440	545	545
700	530	530	530	555	510	570	555	570	570	570	435	435	540	540
750	505	505	505	505	475	530	505	530	530	530	425	425	530	530
800	410	410	410	410	390	510	410	510	510	510	420	420	/	/
850	320	320	320	320	300	485	320	485	485	485	420	420	/	/
900	230	230	230	225	200	450	225	375	450	450	415	415	/	/
950	135	135	135	135	135	320	135	275	375	385	385	385	/	/
1000	85	85	85	85	85	215	85	200	255	365	365	365	/	/
1050	/	/	/	/	/	145	/	145	170	360	160	160	/	/
1100	/	/	/	/	/	95	/	100	115	300	305	305	/	/
1150	/	/	/	/	/	65	/	60	75	225	235	235	/	/
1200	/	/	/	/	/	40	/	35	50	145	185	185	/	/
1250	/	/	/	/	/	/	/	/	/	/	145	145	/	/
1300	/	/	/	/	/	/	/	/	/	/	115	115	/	/
1350	/	/	/	/	/	/	/	/	/	/	95	95	/	/
1400	/	/	/	/	/	/	/	/	/	/	75	75	/	/
1450	/	/	/	/	/	/	/	/	/	/	60	60	/	/
1500	/	/	/	/	/	/	/	/	/	/	40	40	/	/

Pressure **Temperatures Ratings ASME B16.34-2009**

600

Temp. F	A105	WCB	LF2	WCC	LCB	WC6	LCC	C5	C12	C12A	316	CF8M	F51	F53
-20 to 100	1480	1480	1480	1500	1395	1500	1500	1500	1500	1500	1440	1440	1500	1500
200	1360	1360	1360	1500	1320	1500	1500	1500	1500	1500	1240	1240	1490	1490
300	1310	1310	1310	1455	1275	1445	1455	1455	1455	1455	1120	1120	1335	1335
400	1265	1265	1265	1405	1230	1385	1405	1410	1410	1410	1025	1025	1230	1230
500	1205	1205	1205	1330	1175	1330	1330	1330	1330	1330	995	995	1160	1160
600	1135	1135	1135	1210	1105	1210	1210	1210	1210	1210	900	900	1115	1115
650	1100	1100	1100	1175	1065	1175	1175	1175	1175	1175	885	885	1095	1095
700	1060	1060	1060	1110	1025	1135	1110	1135	1135	1135	870	870	1085	1085
750	1015	1015	1015	1015	955	1065	1015	1065	1065	1065	855	855	1065	1065
800	825	825	825	825	780	1015	825	1015	1015	1015	845	845	/	/
850	640	640	640	640	595	975	640	975	975	975	835	835	/	/
900	460	460	460	445	405	900	445	745	900	900	830	830	/	/
950	275	275	275	275	275	640	275	550	755	775	775	775	/	/
1000	170	170	170	170	170	430	170	400	505	725	725	725	/	/
1050	/	/	/	/	/	290	/	290	345	720	720	720	/	/
1100	/	/	/	/	/	190	/	200	225	605	610	610	/	/
1150	/	/	/	/	/	130	/	125	150	445	475	475	/	/
1200	/	/	/	/	/	80	/	70	105	290	370	370	/	/
1250	/	/	/	/	/	/	/	/	/	/	295	295	/	/
1300	/	/	/	/	/	/	/	/	/	/	235	235	/	/
1350	/	/	/	/	/	/	/	/	/	/	190	190	/	/
1400	/	/	/	/	/	/	/	/	/	/	150	150	/	/
1450	/	/	/	/	/	/	/	/	/	/	115	115	/	/
1500	/	/	/	/	/	/	/	/	/	/	85	85	/	/

900

Temp. F	A105	WCB	LF2	WCC	LCB	WC6	LCC	C5	C12	C12A	316	CF8M	F51	F53
-20 to 100	2220	2220	2220	2250	2090	2250	2250	2250	2250	2250	2160	2160	2250	2250
200	2035	2035	2035	2250	1980	2250	2250	2250	2250	2250	1860	1860	2230	2230
300	1965	1965	1965	2185	1915	2165	2185	2185	2185	2185	1680	1680	2000	2000
400	1900	1900	1900	2110	1845	2080	2110	2115	2115	2115	1540	1540	1845	1845
500	1810	1810	1810	1995	1760	1995	1995	1995	1995	1995	1435	1435	1740	1740
600	1705	1705	1705	1815	1655	1815	1815	1815	1815	1815	1355	1355	1670	1670
650	1650	1650	1650	1765	1600	1765	1765	1765	1765	1765	1325	1325	1640	1640
700	1590	1590	1590	1665	1535	1705	1665	1705	1705	1705	1305	1305	1625	1625
750	1520	1520	1520	1520	1430	1595	1520	1595	1595	1595	1280	1280	1595	1595
800	1235	1235	1235	1235	1175	1525	1235	1525	1525	1525	1265	1265	/	/
850	955	955	955	955	895	1460	955	1460	1460	1460	1255	1255	/	/
900	690	690	690	670	605	1350	670	1120	1350	1350	1245	1245	/	/
950	410	410	410	410	410	955	410	825	1130	1160	1160	1160	/	/
1000	255	255	255	255	255	650	255	595	760	1090	1090	1090	/	/
1050	/	/	/	/	/	430	/	430	515	1080	1080	1080	/	/
1100	/	/	/	/	/	290	/	300	340	905	915	915	/	/
1150	/	/	/	/	/	195	/	185	225	670	710	710	/	/
1200	/	/	/	/	/	125	/	105	155	430	555	555	/	/
1250	/	/	/	/	/	/	/	/	/	/	440	440	/	/
1300	/	/	/	/	/	/	/	/	/	/	350	350	/	/
1350	/	/	/	/	/	/	/	/	/	/	290	290	/	/
1400	/	/	/	/	/	/	/	/	/	/	225	225	/	/
1450	/	/	/	/	/	/	/	/	/	/	175	175	/	/
1500	/	/	/	/	/	/	/	/	/	/	125	125	/	/

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Notes

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